The TOOL ENGINEER

FEBRUARY 1955

SHELL MOLDING

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

Cover: Shell mold casting combines the flexibility of casting operations with the accuracy of machining in a production process that can be largely automatic. The process and its possibility are discussed by Otto W. Winter in his article beginning on Page 73.

The Tool Engineer

Volume XXXIV, No. 2 February 1955

TECHNICAL ARTICLES

ASTE NEWS

DEPARTMENTS

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER

Executive & Editorial Offices:
10700 Puritan Ave.
Detroit 38, Mich.

Publication Office:
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other countries, $8.00 per year.

The Tool Engineer

Always a Better Way

We have grown to expect a constant flow of developments leading to better ways to produce all types of products. Improvements in production processes and the development of new methods are results of the normal engineering approach. Without analysis and interpretation of accumulated data and experience, this progress could not continue at its present pace.

Typical of the promising newer processes is shell molding, discussed in this issue. As with aluminum extruding, treated in the previous issue, shell molding lends itself admirably to automatic operations. Even more important is the control of quality that is possible. The castings are uniform and made to close tolerances, leaving minimum stock for machining operations.

In extruding aluminum, new techniques provide for mandrel positioning to vary the wall thickness as desired. Also, the dies may be expanded to vary the shape, either increasing or decreasing dimensions as the extrusion operation progresses. By placing material where it is wanted in primary operations such as this, subsequent machining is simplified.

Present trends in production methods remove much of the burden of hogging during machining operations. Possibly, there will be less emphasis on developing machine tools capable of removing chips with larger sections at faster rates. Even more attention can then be devoted to greater precision in metal-cutting. When less metal is removed, machining time becomes relatively less important in the machine cycle, attracting more attention to loading, traversing, unloading, etc.

Changes in any phase of production can set up chain reactions. To take advantage of opportunities offered by an improvement warrants a study by the tool engineer of its possible effects on the entire manufacturing process. In applying new methods, he should never lose sight of their impact upon the worker and society. He must present them in their proper light so they will not be misunderstood.

John W Greve

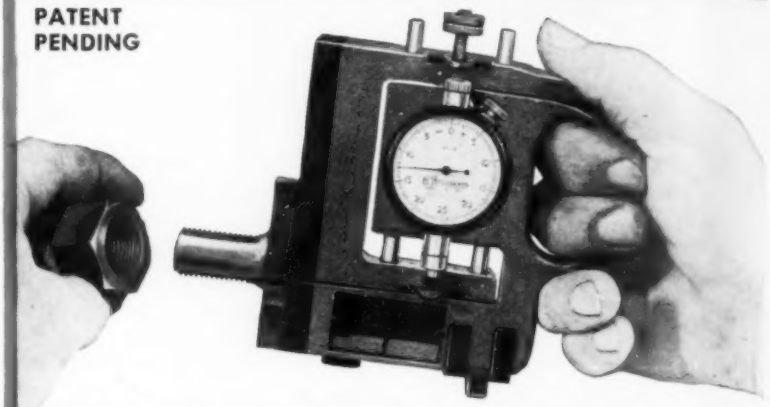
EDITOR

Newer Than NEW!... Versa-Dial

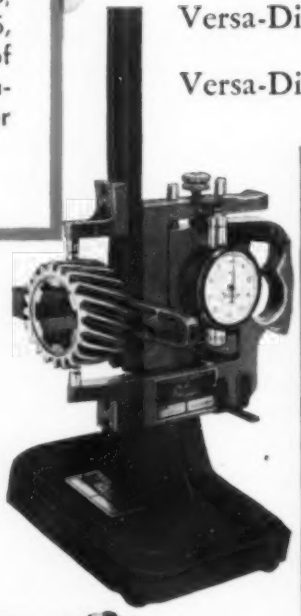
Introducing STANDARD'S new truly all purpose dial unit . . . a simple, easily operated, direct reading instrument, with a potential for nearly all types of INTERNAL and EXTERNAL applications.

Interchangeable segments permit checking of THREADS for over-all fit, pitch diameter, or lead. Gears for pitch diameter or tooth spacing; also GROOVES, shallow COUNTERBORES, narrow SHOULDERS, BLIND HOLES, etc. . . . an almost unlimited variety of work. The VERSA-DIAL can be converted from one type of job to another in moments.

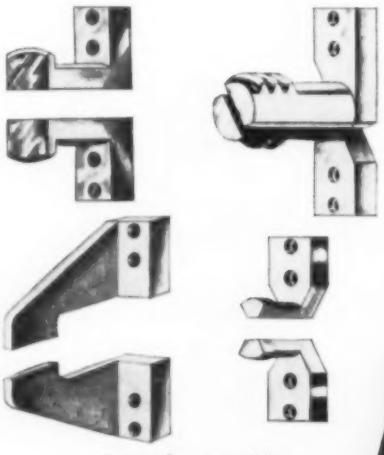
PATENT PENDING



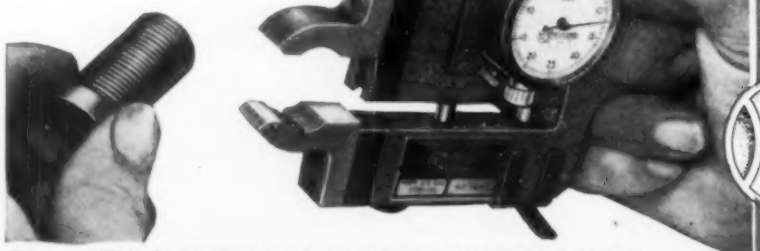
Versa-Dial **INTERNAL THREAD COMPARATOR**



Versa-Dial **HELICAL GEAR PD COMPARATOR**
mounted on bench stand



Interchangeable Segments



Versa-Dial **EXTERNAL THREAD COMPARATOR**

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- ★ **EXCEPTIONALLY WIDE RANGE** up to 7" or more
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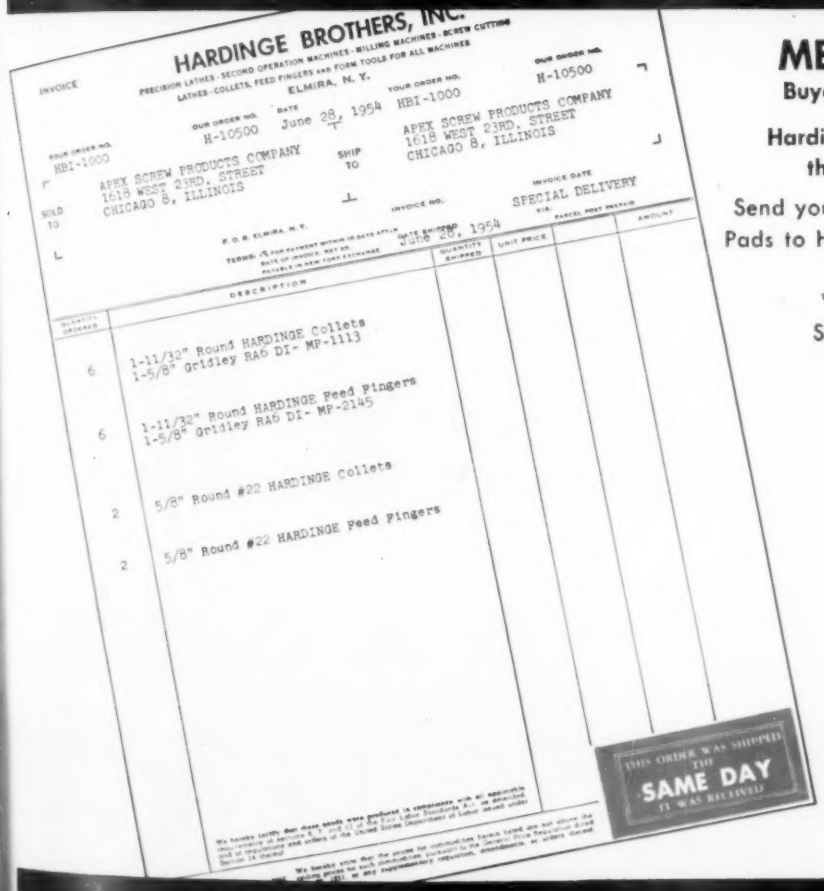

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QUANTITY ORDERED	DESCRIPTION	QUANTITY SHIPPED	UNIT PRICE	AMOUNT
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We hereby certify that these goods were produced in compliance with all applicable requirements of sections 6, 7 and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

We hereby state that the prices for commodities herein listed are not above the prices charged for such commodities, pursuant to the General Price Regulation dated ..., 1951, or any supplementary regulation, amendments or orders thereof.

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PRECISION *plus*

. . . threads cut to Class 7 tolerances

Continuous threads cut on studs must meet exacting requirements to withstand the high pressures and temperatures to which pressure vessels, steel pipe flanges, fittings, and valves are subjected.

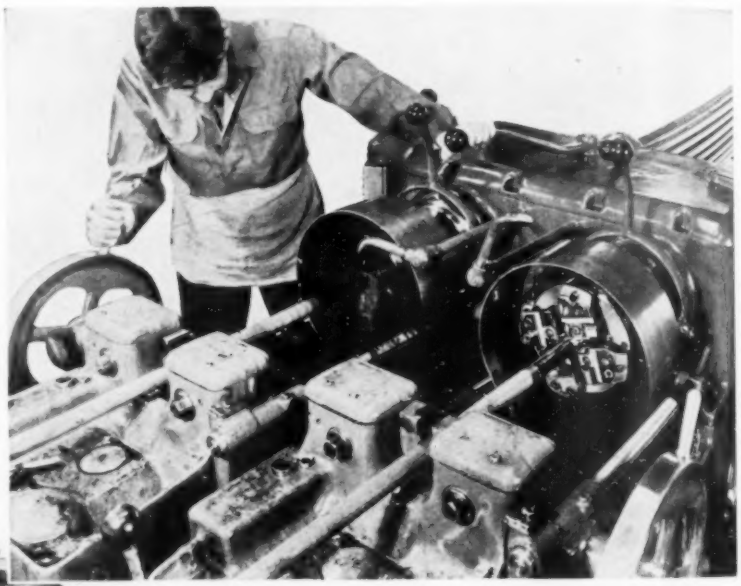
At the R.E.C. Corporation, New Rochelle, N. Y., continuous 1⅜" 8P threads are cut to within pitch diameter limits of .002 on 12-foot heat-treated bar stock of 269 to 311 Brinell hardness. The fully threaded bars are then cut into the desired stud lengths.

By using Double Head LANDMACO Leadscrew Threading Machines equipped with Hardened and Ground 2" LANCO VV Heads, threads ranging in diameter from ½" to 2" are cut in one pass with consistently fine finish to Class 7 tolerances. The leadscrew provides a positive, mechanical means of feeding the work into the die heads, thus assuring the maintenance of close lead tolerances.

Even on this precision threading operation, net production is good, averaging 36 linear feet per hour at a cutting speed of 25 surface feet per minute. An average of 108 linear feet of threads is cut between chaser regrindings, resulting in low tool cost and minimum down time.

Having given many similar outstanding performances in other fields, LANDMACO Machines can help to cut costs, step up output, and improve finish and accuracy in your thread production.

For complete information, write for Bulletin H-75.



LANDIS MACHINE COMPANY

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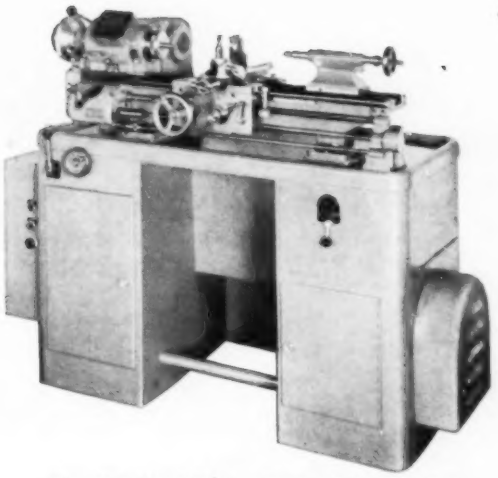
THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

obsolete machines are costing you *plenty!*

. . . you can make money with these 4 Wade precision machines

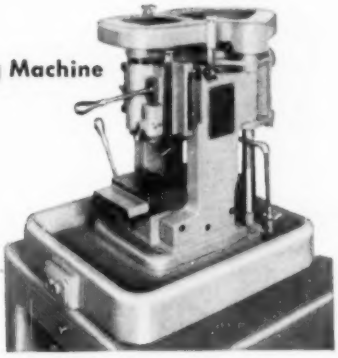
To keep pace with your competition, you need the latest, *most efficient* production machines you can buy. Here are four that are remarkably accurate — designed and built throughout for precision work to close tolerances. Some of the features on each machine are patented and exclusive. All machines are carefully described in Bulletins, available on request.



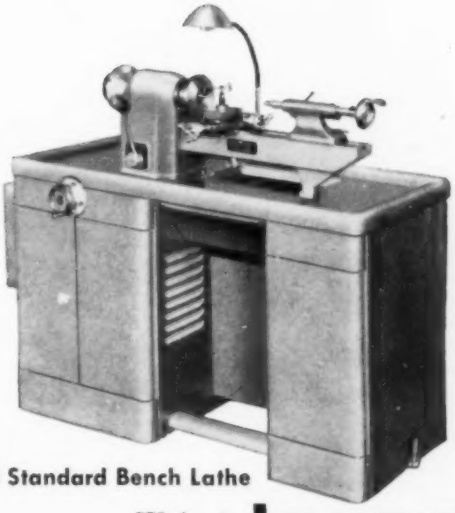
No. 8A Tool Maker's Precision Lathe

A variable speed feed for the feed rod is available as optional equipment. It provides an independent powered longitudinal or cross feed which permits the operator to change the rate of feed while the tool is under cut to secure the desired work finish during turning, facing or boring operations. The rate of feed for variable speed feed is controlled by a potentiometer.

Hand Profiling Machine



No. 73 Hand Screw Machine



No. 73 Standard Bench Lathe

Write to **59 RIVER STREET**

THE WADE TOOL CO.

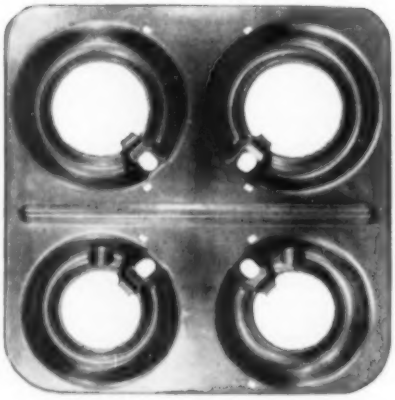
WALTHAM 54, MASS., U. S. A.

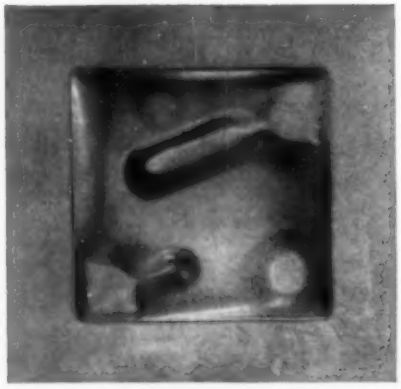
MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

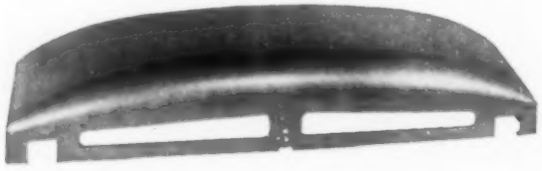
Plastic Low Cost Tooling

For

Dies · · · Drill, Welding, and Assembly Jigs







Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

Major Vulcan Services . . . Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO....PLASTIC TOOL DIVISION

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NOW . . . a **BROACHING MACHINE** *for every shop!*

announcing

LAPOINTE

4 small sizes

BROACHING MACHINES

- **LOW IN PRICE**
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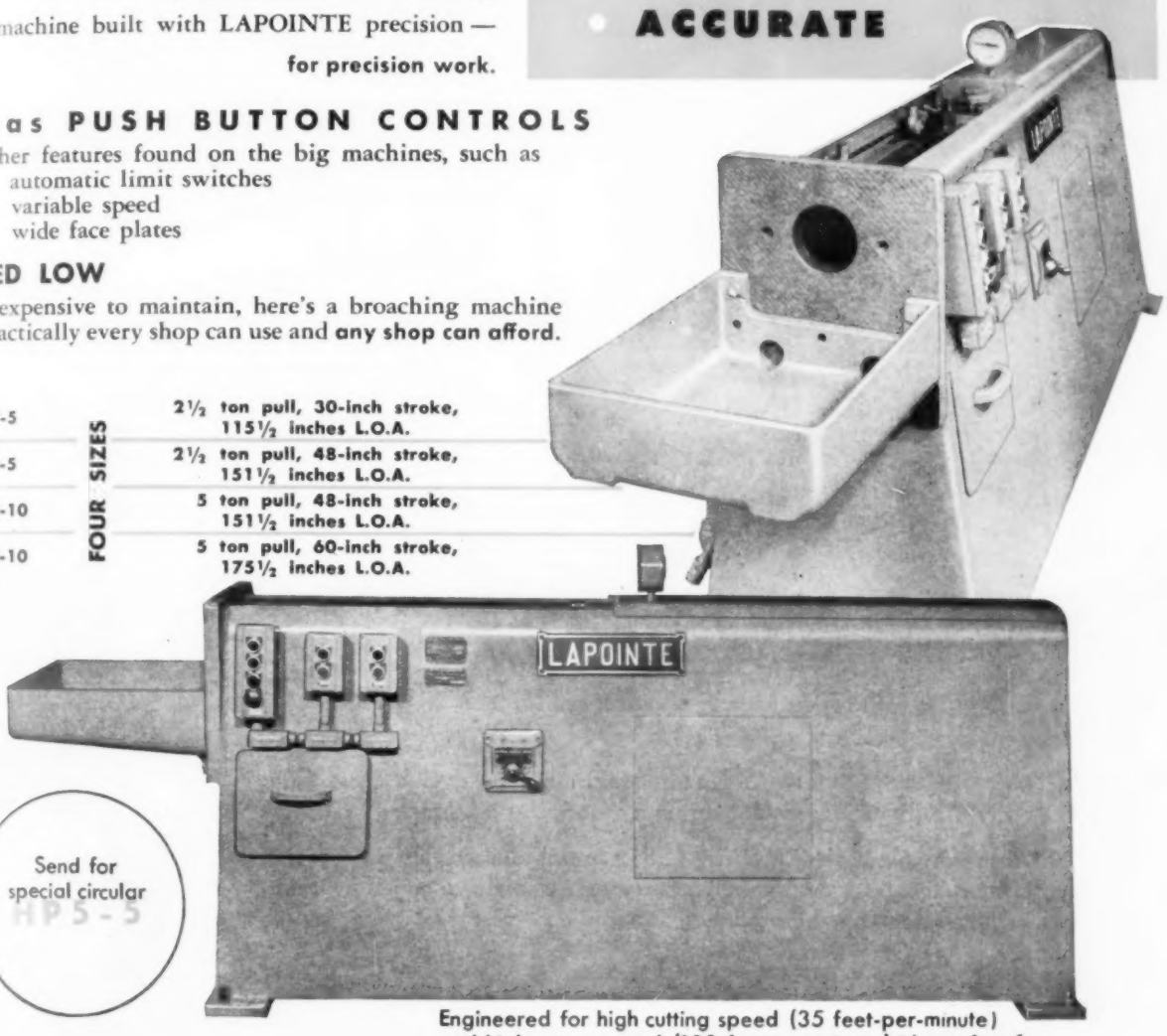
- **FAST**
- **ACCURATE**

For **the smaller shops** and tool rooms, here's an all-purpose, universal broaching machine built with LAPOINTE precision — **for precision work.**

it has PUSH BUTTON CONTROLS
and other features found on the big machines, such as
automatic limit switches
variable speed
wide face plates

PRICED LOW
and inexpensive to maintain, here's a broaching machine that practically every shop can use and **any shop can afford.**

	FOUR SIZES	
HP-5		2½ ton pull, 30-inch stroke, 115½ inches L.O.A.
HP-5		2½ ton pull, 48-inch stroke, 151½ inches L.O.A.
HP-10		5 ton pull, 48-inch stroke, 151½ inches L.O.A.
HP-10		5 ton pull, 60-inch stroke, 175½ inches L.O.A.



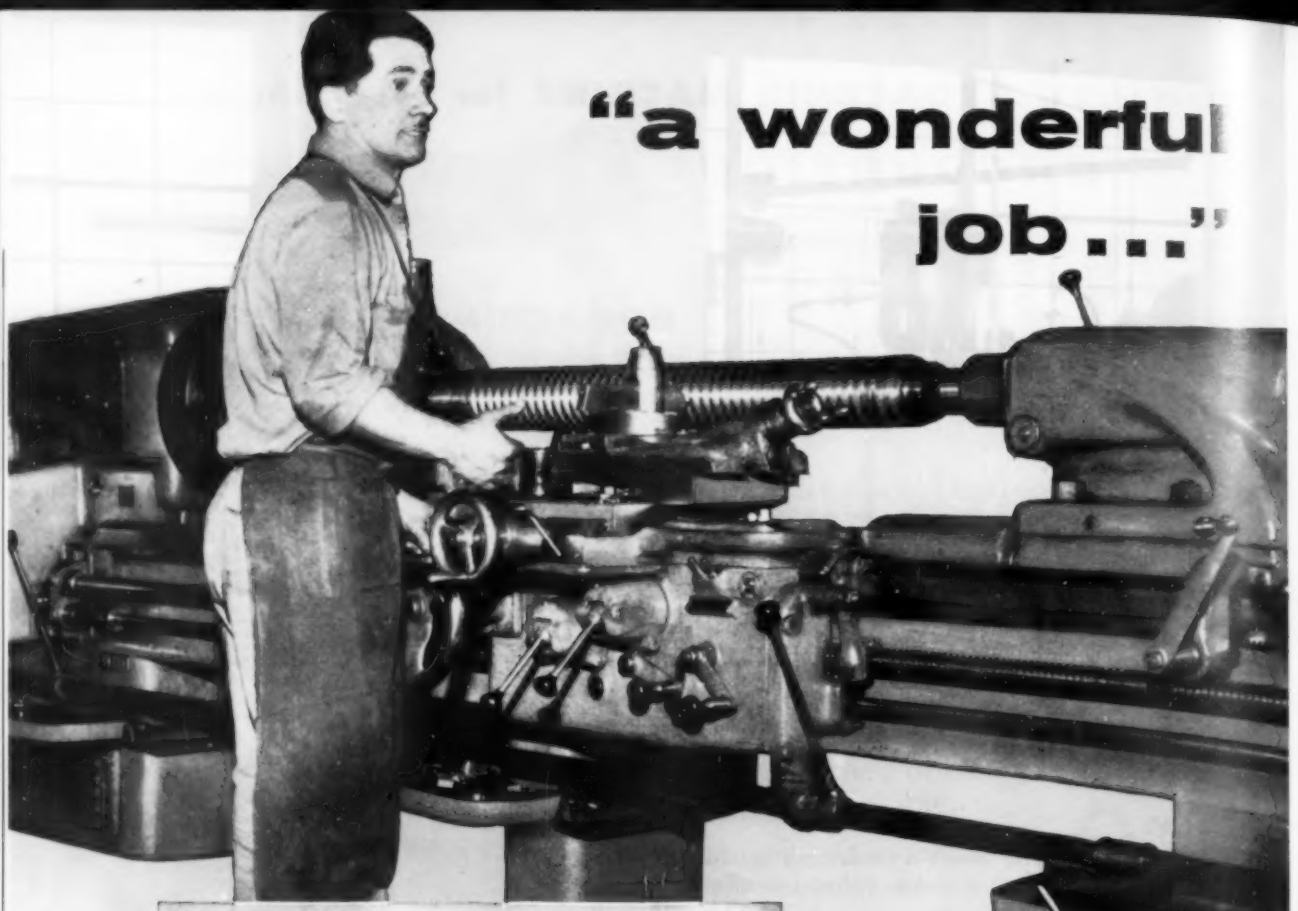
Send for special circular HP5-5

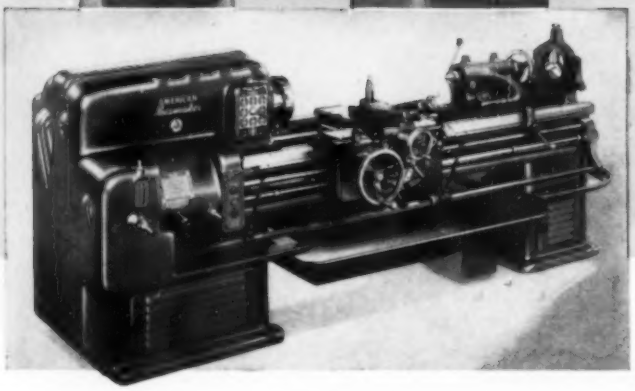
Engineered for high cutting speed (35 feet-per-minute) and high return speed (100 feet-per-minute) it's perfect for small work *where fast production with accuracy is essential!*

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

"a wonderful job..."





Mr. Ray Hogan of McGee & Hogan Machine Works, Salt Lake City, Utah says "Your machines are doing a wonderful job for us."

This company uses "AMERICAN" Lathes and Radial Drills. It is known throughout the inter-mountain territory as a leader in metal working contracting, enjoying a reputation for low cost and quality second to none.

The accompanying illustration shows one of their 20-inch heavy duty "AMERICAN" Pacemaker Lathes chasing a large screw for a customer who has suffered a breakdown on one of his machines. The factor of time, cost and quality are paramount on a job of this kind. Mr. Hogan says his "AMERICAN" met this challenge one hundred percent.

Whether your work is production, maintenance or tool room, the power, ruggedness, range and stabilized accuracy of "AMERICAN" Pacemaker Lathes meet each and every requirement.

Send for bulletin No. 16 and get the facts.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

Now... modernize your grinding operations
without draining away your capital!

Take advantage of the **Norton**

Grinding Machine Lease Program

for low-cost leasing of new
Norton grinders and lappers

Naturally, you want to meet competition on at least equal terms — with the latest and best in modern grinding equipment.

Yet, like so many other manufacturers, you may want to conserve your working capital — and so the cost of replacing inefficient producers is delaying, if not prohibiting, your modernization.

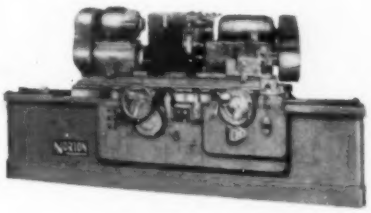
What's the answer?

The answer is the Norton Grinding Machine Lease Program, developed to help manufacturers secure the grinders and lappers they need for modernization — without weakening their financial position.

The new Norton Program gives you three separate plans for leasing new Norton grinders and lappers, with payments extending over a seven-year period. Each plan meets specific requirements. Each plan is extremely flexible, providing for early termination of the lease, or purchase of the equipment, at your option.

One of these plans may help pave the way to better business for you. Don't miss getting complete facts on them — send in the coupon!

This folder tells you how you can pay for Norton machines while they're building your profits!



10 x 36" Type CTU Semiautomatic Cylindrical Grinder

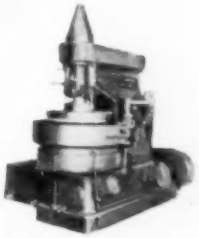
8" Hydraulic Surface Grinder

No. 20 Cutter and Tool Grinder

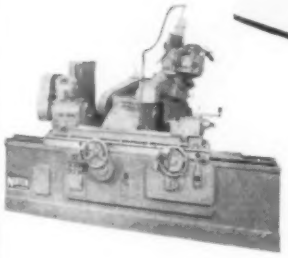
Presenting...

the NORTON Grinding Machine Lease Program

Three tested plans that enable you to modernize with new grinders and lappers while conserving your capital.



No. 26 HYPROLAP Lapping Machine*



Type CV-4 Semiautomatic Angular Wheelslide Grinder

12" Universal Grinder

Under the Norton Grinding Machine Lease Program the machines illustrated here--and many more — are now available to you, under low-cost, flexible leasing arrangements.

This folder describes the Program giving details of the three different plans by which you can improve your competitive position and profits. Send for it now — and remember: only Norton brings you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

District Sales Offices: Worcester • Hartford
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NORTON COMPANY, *Machine Division*
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Please send me your folder on the Norton Grinding Machine Lease Program.

Name.....

Title.....

Company.....

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City.....*Zone*....*State*.....

New!

The New *Modern* MC Collapsible Tap

Stationary and Rotary, and in five sizes ranging from 1 5/16" to 3½", these New MC Taps have more new features—money saving features—than we can tell you about in this ad.

The complete story is in Bulletin M-113. It's yours for the asking. Mail this coupon today!

CONSOLIDATED MACHINE TOOL CORP.
MODERN TOOL WORKS DIVISION
566 Blossom Road, Rochester 10, N. Y.

Please send me without obligation your new Bulletin M-113 giving full information on modern MC Collapsible Taps.

Name.....

Title.....

Firm Name.....

Address.....

City..... Zone..... State.....

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER, NEW YORK

WHOLLY OWNED SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

SHORT STROKES ON IDLE STATIONS PAY OFF WITH LONG SAVINGS

This Fastermatic Feature Saves both Cycle Time and Changeover Time

Here, the Gisholt 2F Fastermatic Automatic Turret Lathe is fully tooled for *both* machining operations on these steel gear forgings. For the first operation, tools on hexagon turret stations 1, 2, 4 and 5 are used. Tools on the front and rear cross slides face and chamfer.

When first operation machining on a lot is completed, tools already on hexagon turret stations 3 and 6 are ready for the second operation. This is possible because of the short stroke cam arrangement, a standard Fastermatic feature, which reduces travel of the hexagon turret saddle. This moves forward only far enough on idle stations to reset the indexing mechanism, saving 4.2 seconds per station.

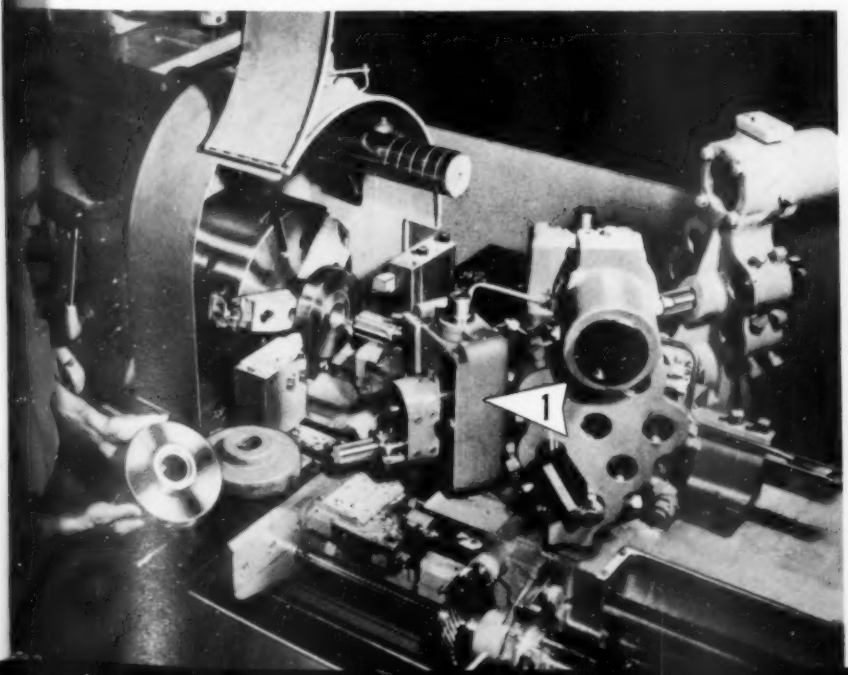
Changeover is a push-over

For the second operation, the short stroke cams operate on hexagon turret stations 1, 2, 4 and 5. Front and rear cross slide tools are changed. The chuck gets soft jaws which are bored and faced "in place" from hexagon turret station 6.

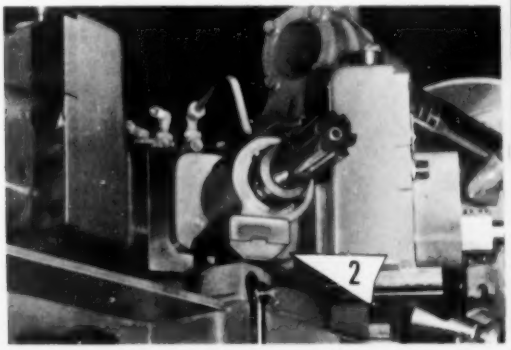
Tools on hexagon turret stations 3 and 6 and on the cross slides complete the part. Time for first operation is 3.30 minutes f.t.f., and for the second, only 1.39 minutes.

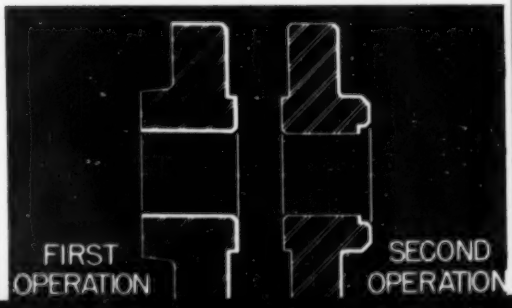
The standard short stroke arrangement reduces traverse time on all idle stations, and permits leaving second operation tooling in place on the hex turret for jobs like this.

1st operation setup. Operator holds second operation part. Adjustable boring head (1) bores and faces soft jaws "in place" and also chamfers co-bore in second operation.



To short stroke tooling on hexagon turret station facing the spindle, operating cam (2) is added. Cam is interchangeable and usable at any station.





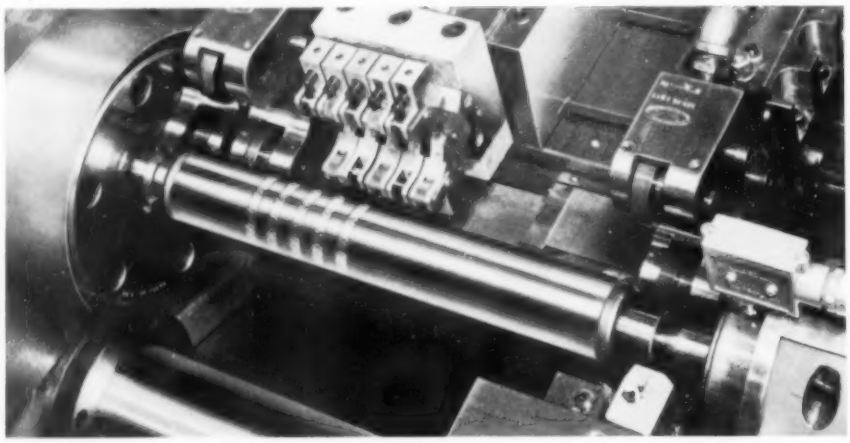
GISHOLT

TIME-SAVING IDEAS

15 SECONDS PER PART...INCLUDING THREADS

High Speed Setup for 6 sizes of grease gun barrels on Hydraulic Automatic Lathe

Setup for producing grease gun barrels shown above.



This is more than a problem of speed. Careful holding and driving are imperative. The material being worked is thin-wall welded sheet tubing.

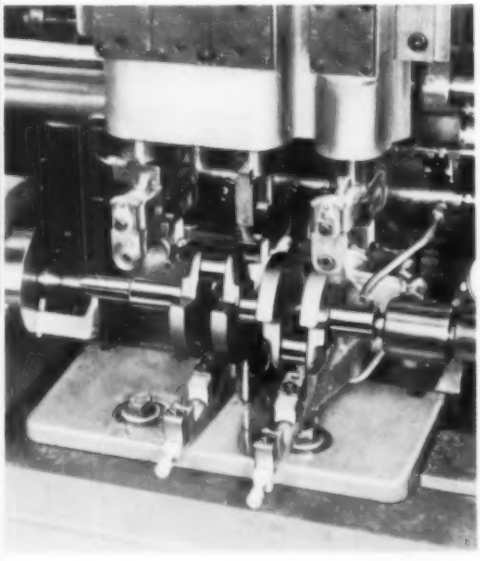
Production is handled on this one Gisholt No. 12 Hydraulic Automatic Lathe. To avoid distorting, the parts are internally supported by bushings at both ends for forming and threading. A tailstock-supported expanding mandrel drives and also equalizes chucking pressure and supports where knurling is done.

Tools on the front carriage turn the right end and form an oil seal. Tools on the rear independent slide roll the threads at both ends and perform knurling. Because knurling is done on the four larger sizes only, the knurling tool block flips back out of the way for the other two sizes.

Production is at a rate of 192 parts per hour at 80% efficiency. Workpieces range from 5" to 15" in length.

The simpler loading and faster machining provided by the No. 12 Automatic Lathe make it possible to produce 4 parts per minute.

60% MORE PRODUCTION WITH 2-IN-1 SUPERFINISHING



All bearing surfaces are Superfinished at once with this double-tooled Superfinisher. All crankshafts shown at right are done on this one machine.

Crankshaft main & pin bearings Superfinished at once

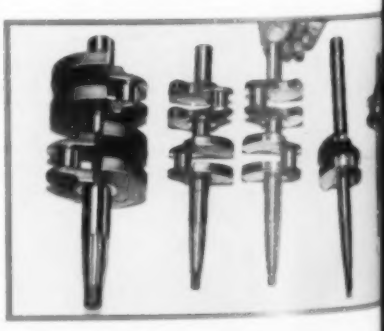
By keeping abreast of new developments, West Bend Aluminum Company, Hartford, Wisconsin, now Superfinishes outboard motor crankshafts 60% faster than before. This Gisholt Model 51A Superfinisher is tooled to Superfinish simultaneously both main and pin bearings on a variety of crankshafts.

With the workpiece loaded, the operator attaches follower-type stoneholder arms to the pin bearings. Pressing a button starts the cycle.

Two, three or four stone-carrying quills Superfinish the main bearing surfaces while the follower-type stoneholder arms do the pin bearings.

Time is only 35 seconds f.t.f. and bearing surfaces are Superfinished from 30 to 40 micro-inches down to 10 to 15 micro-inches RMS. This *controlled* 10 to 15 micro-inch "frosty" finish holds oil and eliminates the need for "breaking in" bearing surfaces. Grinding marks are removed and all amorphous smear metal scrubbed away.

In this interesting setup, both main and pin bearings are Superfinished in one operation, thus saving time and money to produce a product that performs better, lasts longer.



Superfinish has made great strides in the past few years. This and many other interesting jobs are shown in the new Superfinish catalog, form No. 1169. Write for your copy.

GISHOLT

TIME-SAVING IDEAS

HOW TO MACHINE CAST IRON AND STEEL AT SAME TIME

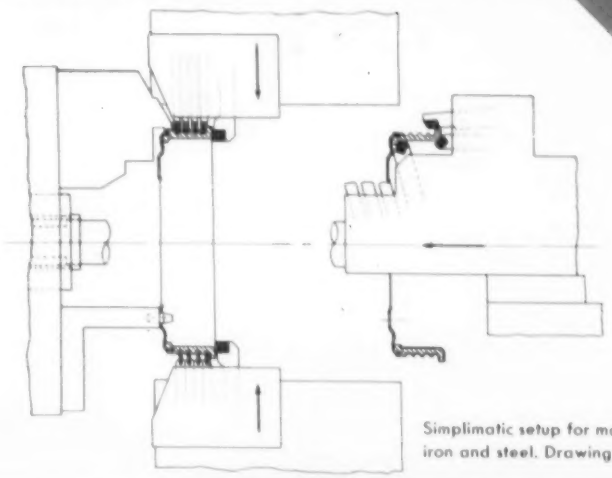
Brake drums handled fast on Simplimatic Automatic Lathe

The workpieces here are brake drums with heavy outer rims of cast iron and stamped back plates of steel. Job requirements are: (1) To do simultaneous machining of two materials, (2) produce a good finish, and (3) complete all work in one chucking.

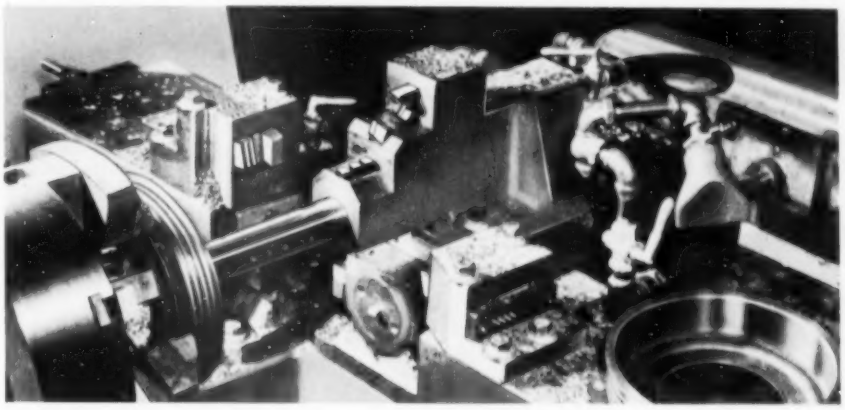
A Simplimatic Automatic Lathe machines the drums, which are 10" in diameter and 2⅜" deep. Chucked on the O.D., wide swivel jaws prevent workpiece distortion. Location is against the back face and drive is through a hole in the steel web.

Carbide-tipped tools on the front and rear slides rough and finish groove and face, while tools on the center slide bore the I.D., chamfer and turn the O.D. of the cast iron rim. At the same time, three high-speed steel tools on the center slide, rough, semi-finish and finish bore the steel back plate. Three tools divide the cut and prevent flaring out of the edges around the bore.

Expert tooling, smart holding and automatic production combine to give a low 1.7 minute f.t.f. time for machining these difficult two-metal parts.

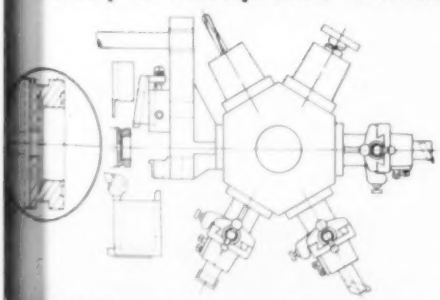


Simplimatic setup for machining drums of cast iron and steel. Drawing shows tooling layout.



SINGLE CHUCKING GUARANTEES ACCURACY OF SPLIT PARTS

Variety of workpieces handled by one Ram Type Lathe



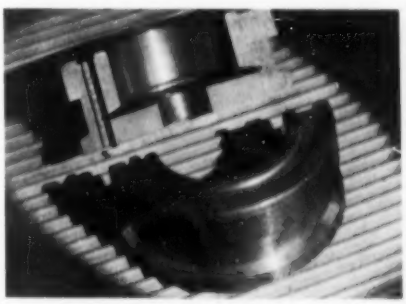
Special air-operated oversize (5¾") collet chuck is supported in steadyrest.

These cast iron neck-ring molds are made from stick castings which are split and ground before coming to this machine. To be certain of parallel faces and concentricity, it is important to hold to one chucking.

Here is how it's done on this Gisholt No. 5 Ram Type Turret Lathe: Standard tools on the hexagon turret core drill, co-bore and recess in the cavity, finish turn the O.D., face and groove. Square turret tools rough turn and face, form and groove. Cutoff is from the rear tool post using reverse feed on the cross slide.

Because stick castings are 16" in length, a ball bearing steadyrest supports the work during all machining operations. Time ranges from 5 to 7 minutes f.t.f.

Parallel faces and concentricity of these divided parts are insured by completing all machining in one handling on a Gisholt Ram Type Turret Lathe.



Completed neck ring for bottle mold.

"What You Should Know About Buying and Renting Machine Tools"

This new bulletin reviews the most current and up-to-date thinking on leasing and time payment plans. Ask for your free copy of P-1173. No obligation, of course.

GISHOLT

TIME-SAVING IDEAS

CORRECTIVE MACHINING CUTS DOWN 155 MM SHELL LOSSES

Gisholt 2L Saddle Type Turret Lathe Performs Money-Saving Service

Shell production is big production. Slips are bound to occur along the line sometimes. The job of this 2L Saddle Type Turret Lathe is to make good shells out of bad ones by performing these five corrective machining operations:

Operation 1 Nose end. Face from square turret, bore and co-bore from hexagon turret.

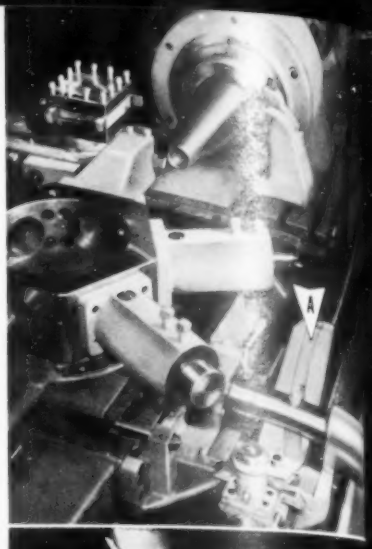
Operation 2 Ogive. Locate from nose end and turn ogive with special tool on hexagon turret governed by special taper attachment cam plate (see A).

Operation 3 Base end and boattail. Face from square turret and turn boattail with square turret tool governed by special taper attachment cam plate.

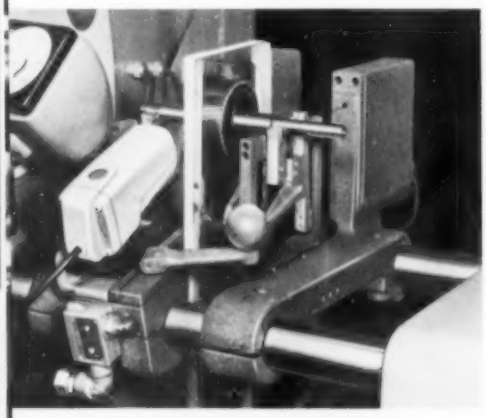
Operation 4 Band groove. Machine band groove with special tool in tool holder at rear of bridge-type cross slide (see B).

Operation 5 Form band. A special form tool in tool holder at rear of bridge-type cross slide forms band.

This standard saddle type lathe equipped with cross-feeding hexagon turret and bridge-type cross slide meets all shell salvage requirements.



AND NOW, STILL MORE SPEED IN PRODUCTION BALANCING



Lever raises or lowers work-driving belt and starts or stops Balancer for simpler, faster loading.

No. 1-255

634

Loading and Starting of Balancer Made Faster by Double-working Attachment

These armatures are dynamically balanced to low tolerances on a Gisholt 1S DYNETRIC Balancing Machine at a very rapid pace. Yet, a further step-up in speed has been made by the use of a belt lifter attachment.

One easy movement of the hand lever raises the work-driving belt to clear the work or bearings for loading and unloading, and at the same time actuates a micro switch to start or stop the machine drive motor. This simple device pays off very well.

This belt lifter attachment combines with the direct-reading amount meter and other Gisholt Balancer features to attain even higher production speeds for accurately balanced parts.

Balancing School, the only one of its kind, is offered by Gisholt. Covers all phases of this important subject. Write for complete details.

DYNETRIC BALANCERS GISHOLT

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

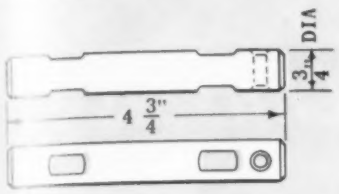
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

THERE'S ONLY ONE WAY
TO DO A JOB BEST...

Another Production Solution

by MOTCH & MERRYWEATHER!

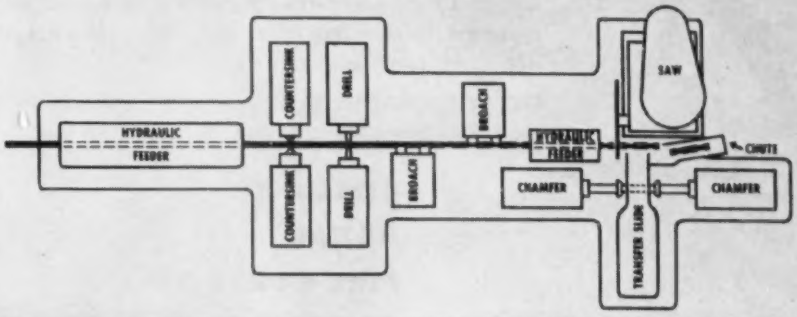
THE JOB TO BE DONE

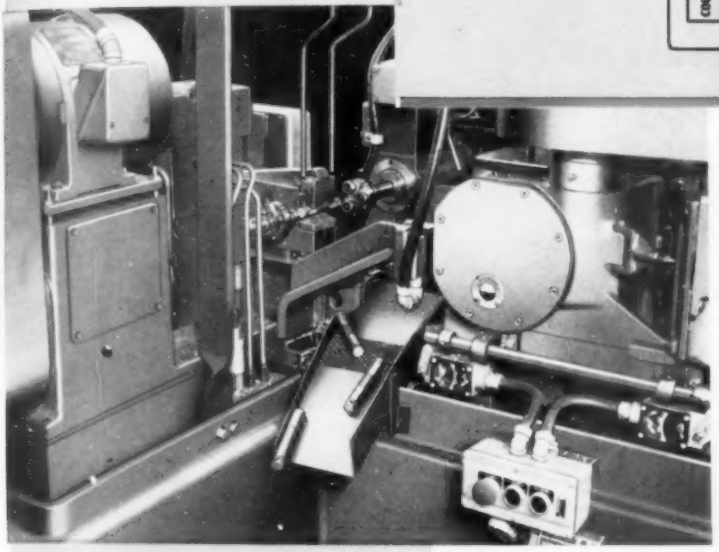


Part: Differential pinion shaft.

Operations: Countersink, drill, broach two sides, Triple-Chip cut off, and chamfer both ends.

HOW M & M DID IT BEST





M & M attained production of 300 pieces per hour at 100% efficiency.

Again, the one best answer is by a Motch & Merryweather in-line automatic transfer machine, designed and built for this one purpose. In-line speedy progression — no wasteful starting and stopping — stock clamping at each station — automatic stock bar loading can be added for complete automation. *Result:* rapid fire production that quickly pays out. This in-line machine is but one illustration of a production solution by Motch & Merryweather.

Ask us now for any production-machining aids. No obligation.

By combining operations, production was increased with a minimum of floor space and labor required.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, also Production Milling, Turning, and Special Machines

what's so different about

Piercing Color TV Chassis?

Color TV chassis are produced in small lots—require frequent engineering changes—setups and production tools are high cost operations.

THE WIEDEMANN RA-41P TURRET PUNCH PRESS economically produces chassis and panels in small lots for

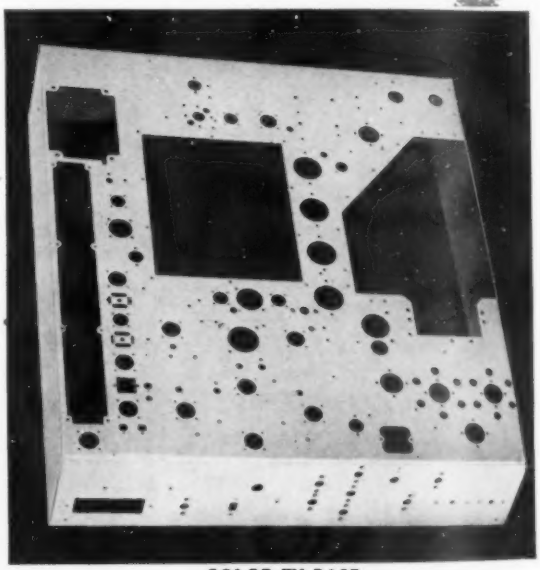
COLOR TV
RADAR
FIRE CONTROL
COMMUNICATIONS
BUSINESS MACHINES
AIRCRAFT

and many other applications

because:

- **Setup time is low**
- **Initial tooling cost is low**
- **Punches and dies are re-used on other jobs so tooling cost soon becomes a negligible factor**
- **Engineering changes are accomplished without delay to production schedules and at low cost**
- **Complete flexibility—close hole centers—20 hole sizes in sheets to 28" x 40" in single handling —40 to 60 holes per minute located to plus or minus .005" tolerance**

These advantages combine to make the RA-41P Wiedemann Turret punch press a paying investment to all chassis fabricators, since the RA-41P is the only machine designed for economically piercing electronic chassis and panels in low runs.



COLOR TV BASE
Quantity 55
(Pierced on Wiedemann RA-41P)
530 strokes of press
31 different punches and dies used
(no special tools)
2 handling operations
TOTAL TIME (floor to floor)
per piece 16.25 MINUTES

Write for a copy of Bulletin 241

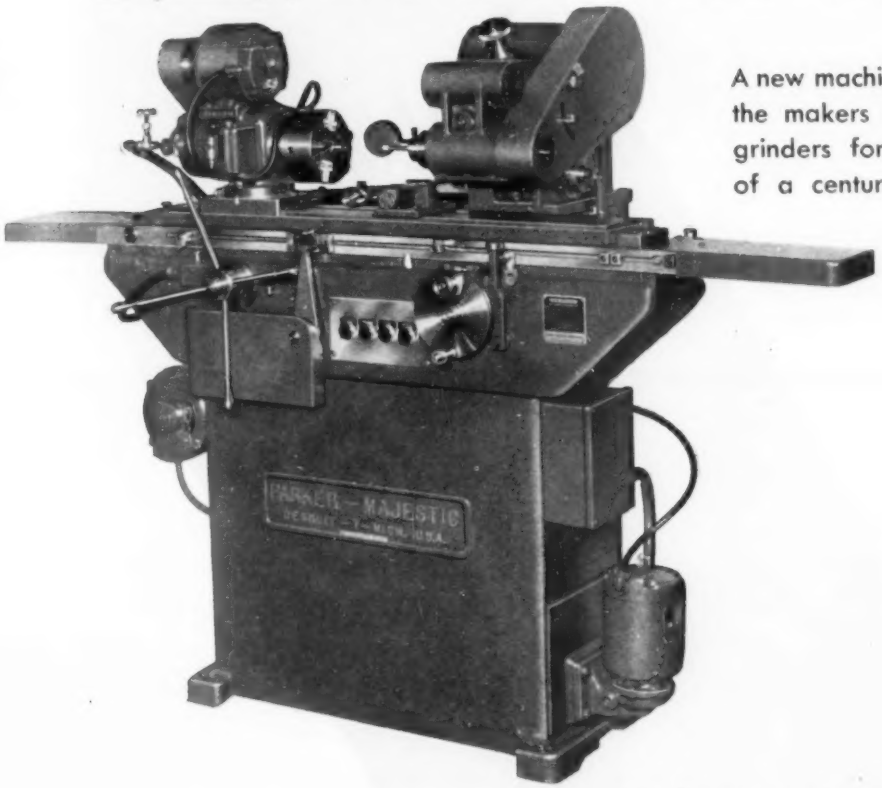
WIEDEMANN MACHINE COMPANY

4245 Wissahickon Avenue, Philadelphia 32, Pa.

PARKER · MAJESTIC pm PRECISION MACHINES

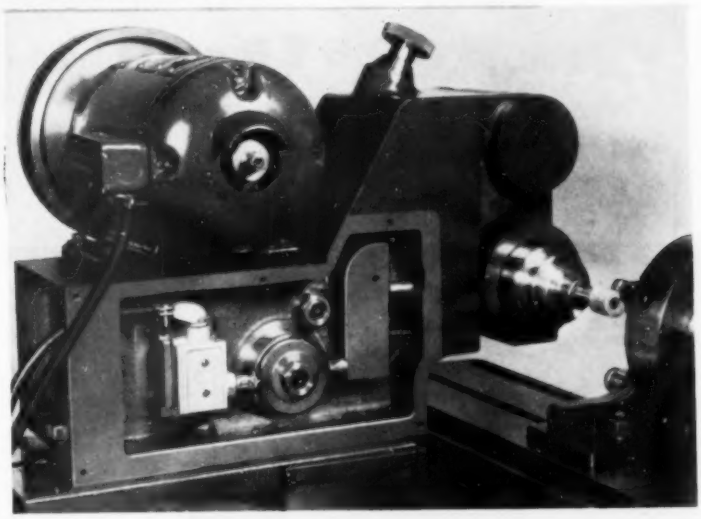
E SEMI-AUTOMATIC INTERNAL GRINDER

Surprisingly Low in Cost with Greater Production



A new machine developed by the makers of fine precision grinders for over a quarter of a century.

AUTOMATIC SPINDLE IN-FEED-CAM ACTUATED



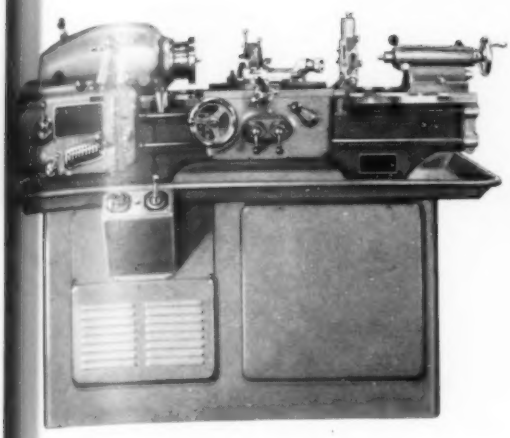
Automatic sizing unit sufficiently versatile for production of one or many pieces. Accurately repeats on additional pieces after completing finished size set up on first piece. Available on either 12″ or 24″ table travel machines.

Table travel is accomplished by any one of three methods.

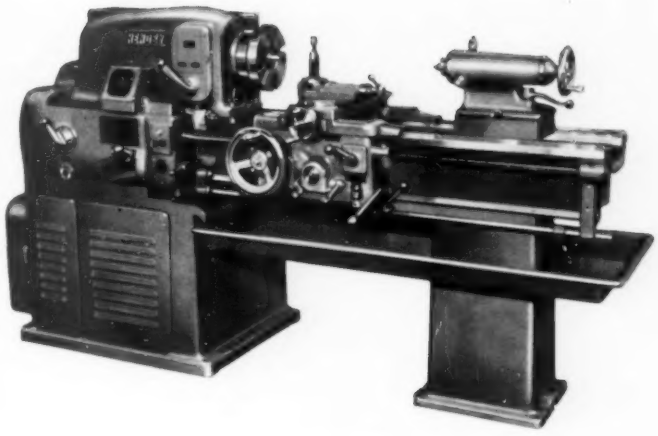
1. **HAND FEED**
2. **RECIPROCATOR**
3. **POWER FEED MECHANISM**

Write for Illustrated Folder

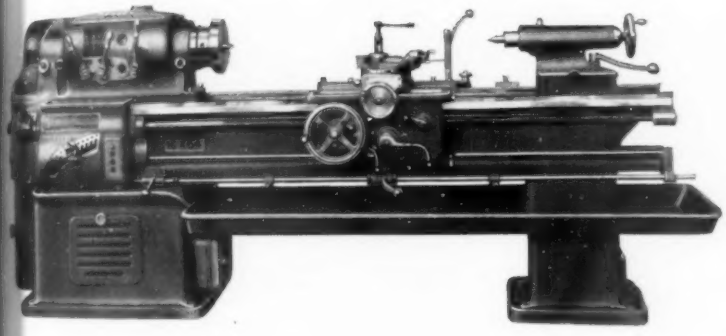
PARKER-MAJESTIC, Inc.
147 JOS. CAMPAU AVE. DETROIT 7, MICHIGAN



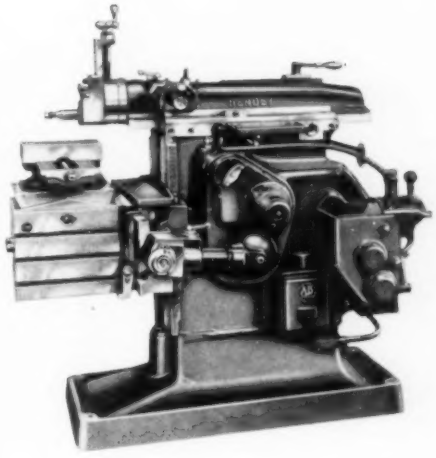
9" Tool and Gagemakers' Lathe



No. 2E General Purpose 14" Lathe



12", 14" and 16" — 18 speed Geared Head Lathe



12" High-Speed Shaper

Hendey machine division

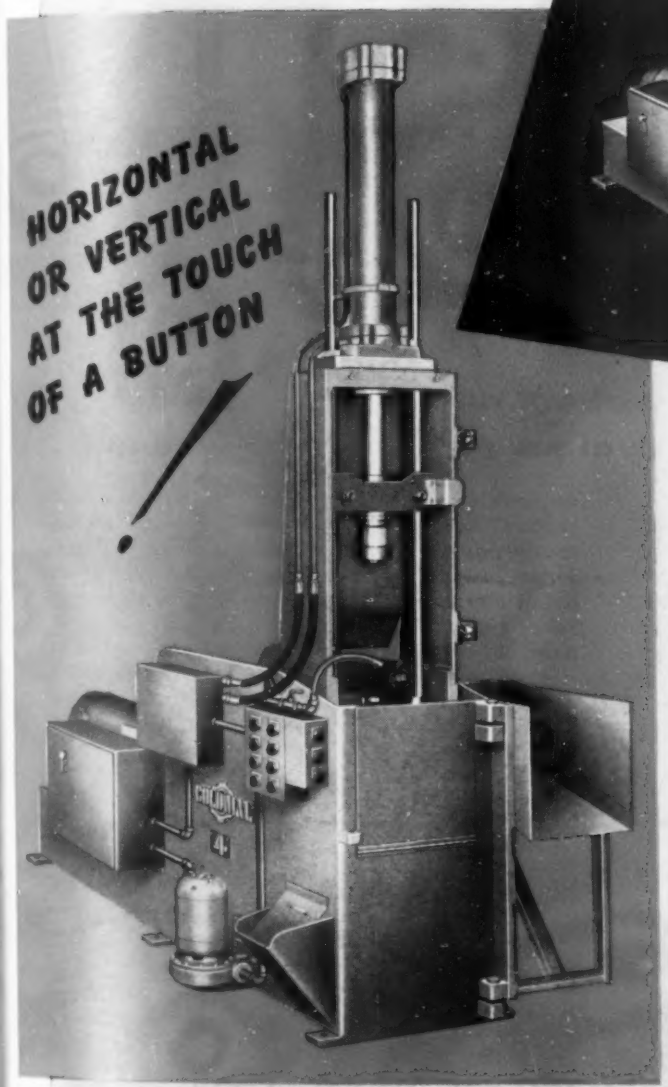
BARBER COLMAN

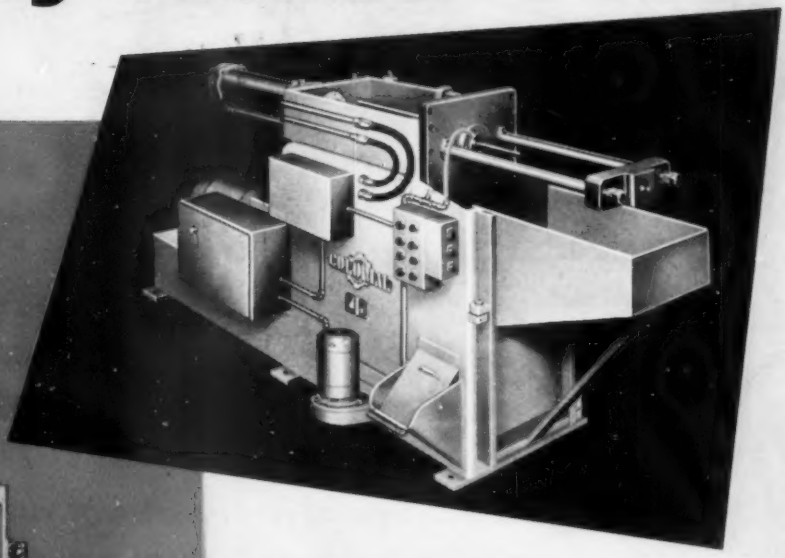
BARBER-COLMAN COMPANY

211 LOOMIS ST., ROCKFORD, ILL.

Announcing....

the COLONIAL "4" *Convertible* Broaching Machine





This amazing new Colonial "4" broaching machine is the answer for the shop that requires a broaching machine flexible enough to be changed from horizontal to vertical and back in a matter of seconds.

It is truly multi-purpose— performing any of four operations:

1. **Push broaching**
2. **Pull-down broaching** } **vertical position**
3. **Press work**
4. **Pull broaching.....horizontal position**

Rated capacity is six tons for pull-down broaching, push broaching, or press work, and four tons for horizontal pull broaching. Stroke capacity is 28" in horizontal and 24" in vertical position. Guide-bar construction maintains accurate alignment throughout the working stroke for pull-down broaching. Safety interlocks prevent tilting the machine unless the ram is retracted.

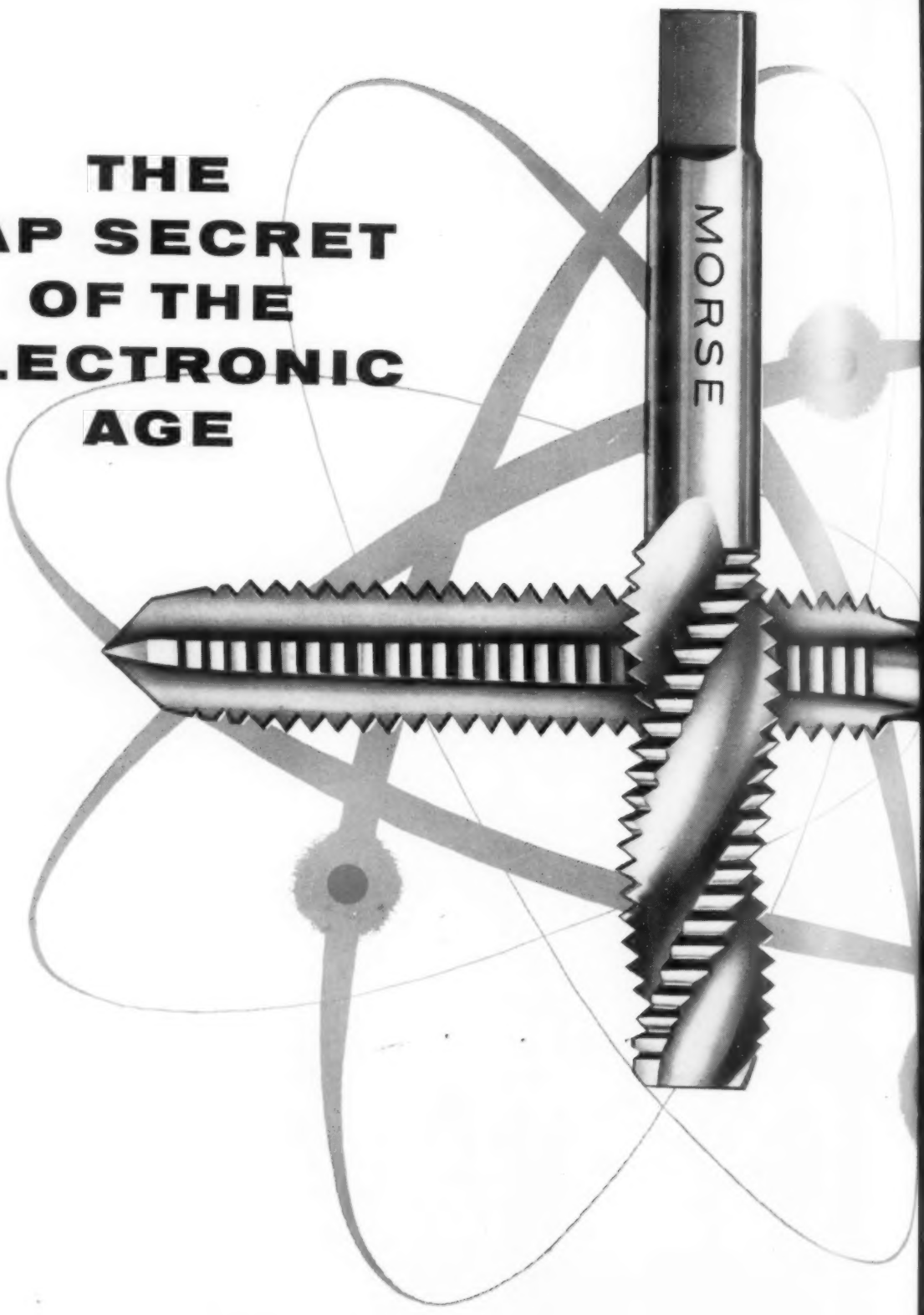
Ask for bulletin FW-55 for complete description of the Colonial "4" Convertible.

PIONEERS OF M.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

THE TAP SECRET OF THE ELECTRONIC AGE



MORSE "Vectormatic Ground" Taps

The Taps with the locked-in precision
. . . quality-protected by an invisible Wall of Electrons!

This exclusive new Morse development obsoletes all previous methods of tap-manufacturing. For "Vectormatic" is an entirely new principle that introduces an unprecedented new method of close-tolerance gaging . . . with the whole gaging system controlled by an invisible wall of electrons activating a series of relays. *Gaging mechanism never touches the work.*

And another exclusive feature of Morse "Vectormatic" Grinding is the "Magic Mike" Control of Tap Sizing. The size-control mechanism and the adjusting segment of the circuit are *completely locked in,* to insure uniformity. Once the proper adjustments have been made, tolerances remain constant . . . nearly 300% closer than old thread-grinding systems.

These and other features of Morse "Vectormatic" Tap Grinding give you far smoother finish, keener cutting edges, and longer tap-life than you have ever known before. And this means higher production at lower cost, on every tapping job. So order from your Morse-Franchised Distributor *today* . . . he's stocked to give you immediate delivery.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

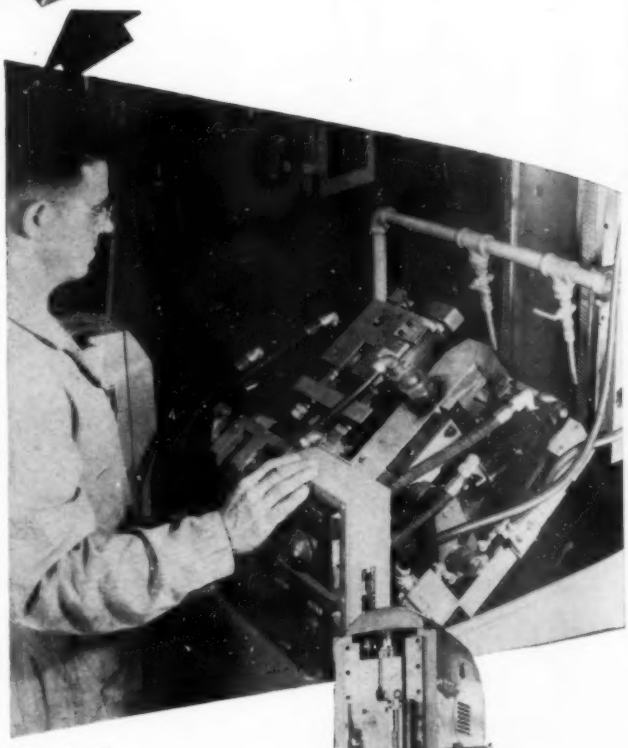
MORSE
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time

MORE EFFICIENT BROACHING...

the *American* way

pawl slot and cam contour broached simultaneously

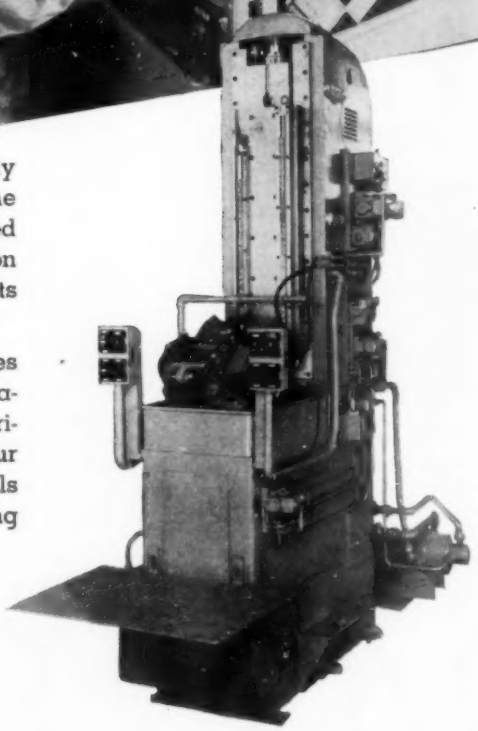


tilting table speeds parts loading and unloading

A cam contour and slot in the pawl of a forged, parking brake part are broached simultaneously in this two-station American broaching machine. Note that the broached surfaces are in different planes. To increase operator efficiency, the two-station fixture tilts back within easy reach for quicker, easier unloading and reloading. At the end of each cycle, part with slot broached at the left hand station is transferred to the right hand fixture for cam contour broaching and the left hand fixture is reloaded with a rough forging.

Push button starts the cycle, hydraulic clamps automatically clamp part and table tilts forward for broaching stroke. The cam contour and slots in the pawl of the part are broached *simultaneously*. The table then tilts back to loading position where parts are automatically released. Production: 150 parts per hour.

Whether you have a single parts surface or multiple surfaces to broach, American engineers will furnish the right combination of machine, tool and fixture design. Why not put American's 35 years of experience in this field to work on your broaching problem. Send a part print or sample with details of your production requirements. Recommendations showing the American way to do the job will be furnished promptly.



American equipped this machine with extra long broach sections because of the considerable variation in parts dimensions encountered. Oversize parts are broached without overloading.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Now...A Completely NEW

Again DELTA sets the pace with the finest line of 14" Drill Presses ever offered . . . at no increase in price!

NEW IN PRECISION PERFORMANCE

You've never seen a 14" drill press perform like these new Rockwell-built Delta machines. Accurate Depth Adjustments are *easy* with the new, positive, self-locking depth stop that you set with one hand. *All* the adjustments, all of the controls, are designed for greater accuracy with greater ease and speed than you've ever known. Yet the new Delta 14" Drill Press is *rugged*, built to *stay* accurate under the toughest production-line abuse.

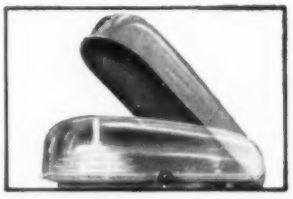
NEW IN COST-CUTTING VERSATILITY

Use the new 14" Delta to drill, counterbore, tap, rout, mortise, shape—and for dozens of other general and specialized jobs. Use it on metal, wood, plastics. Use it to supplement—or replace—more expensive single-purpose equipment throughout your shop. There is practically no limit to the ways in which the versatile new Delta 14" can turn out precision work for you—faster, with less operator fatigue, and at lower cost!

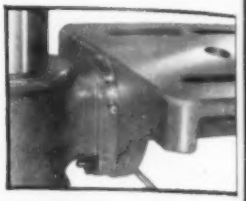
NEW IN EVERYTHING BUT PRICE!

The new 1955 DELTA 14" Drill Press gives you many new features, but it costs no more than previous models. Only Delta—long the drill press leader—has both the manufacturing know-how and the sales volume to give you *more* for your money. So don't put off seeing the new Delta 14" floor models, bench models, single and multiple spindle models. They're all *new*, all *better* than ever, and your Delta Dealer has them *at no increase in price!*

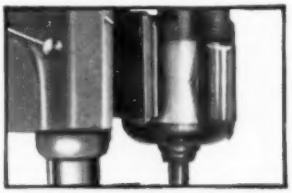
NEW IN ALL THESE WAYS....



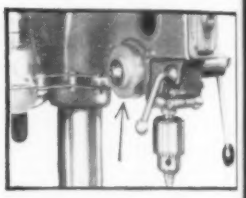
New counter-balanced belt guard stays up out of way when changing speeds.



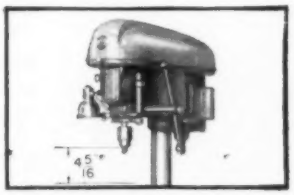
New tilting table has clamping ledges and calibrated scale for quick positioning.



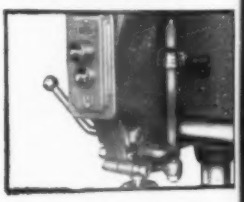
New pivoting motor mounting plate, speeds changes, lengthens belt life.



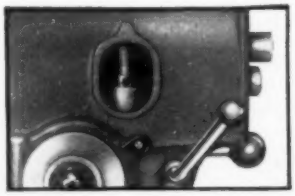
New quick-set depth gage for faster, more accurate depth-of-penetration readings.



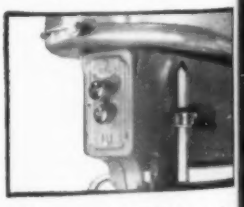
New greater-capacity quill design allows full 4 5/16" spindle travel.



New self-locking depth stop with micrometer sleeve calibrated to .002".



Spindle is fully enclosed with new side opening for easy changeover.



New control design puts accessory push-button starter up front for quick, safe control.

DELTA
ROCKWELL

DELTA QUALITY
COSTS NO MORE

DELTA QUALITY POWER TOOLS
Another Product by **ROCKWELL**

DELTA 14" Drill Presses!

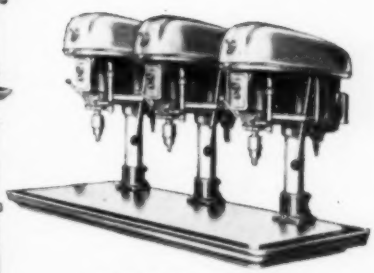
BENCH MODEL

SEE THEM NOW!

A ten-minute demonstration will tell you more than ten thousand words about the great new DELTA 14" Drill Press line! See for yourself how they give you so much that's new and better without losing any of the best time tested Delta features. See how the *low* Delta price gives you the biggest drill press value in history!

Let your Delta Dealer demonstrate the great new line of Delta 14" Drill Presses *now!* He's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY."

FLOOR MODEL
(shown with special production table, accessory foot feed and push-button control.)



MULTIPLE SPINDLE MODEL
(from 2 to 200 heads!)

BE SURE TO SEND
THIS COUPON FOR FULL CATALOG DATA

Delta Power Tool Division, Rockwell Manufacturing Company
6208 North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send catalog on new Delta 14" Drill Press line.

☐ Please send name of my nearest Delta Dealer who has the new 14" Drill Press on display.

Name _____ Title _____

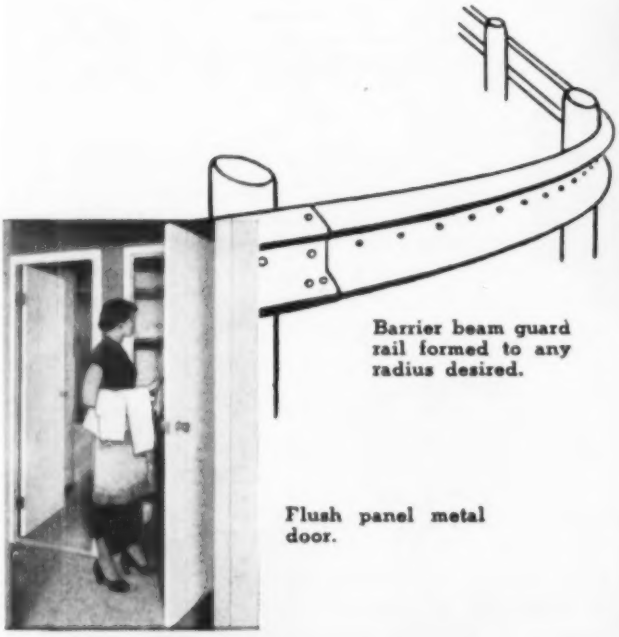
Company _____

Address _____

City _____ County _____ State _____

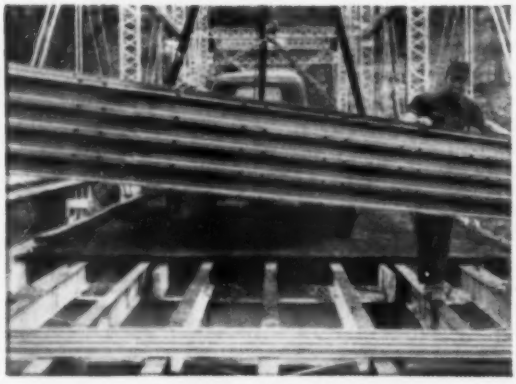
this CINCINNATI

is giving accurate and versatile performance at

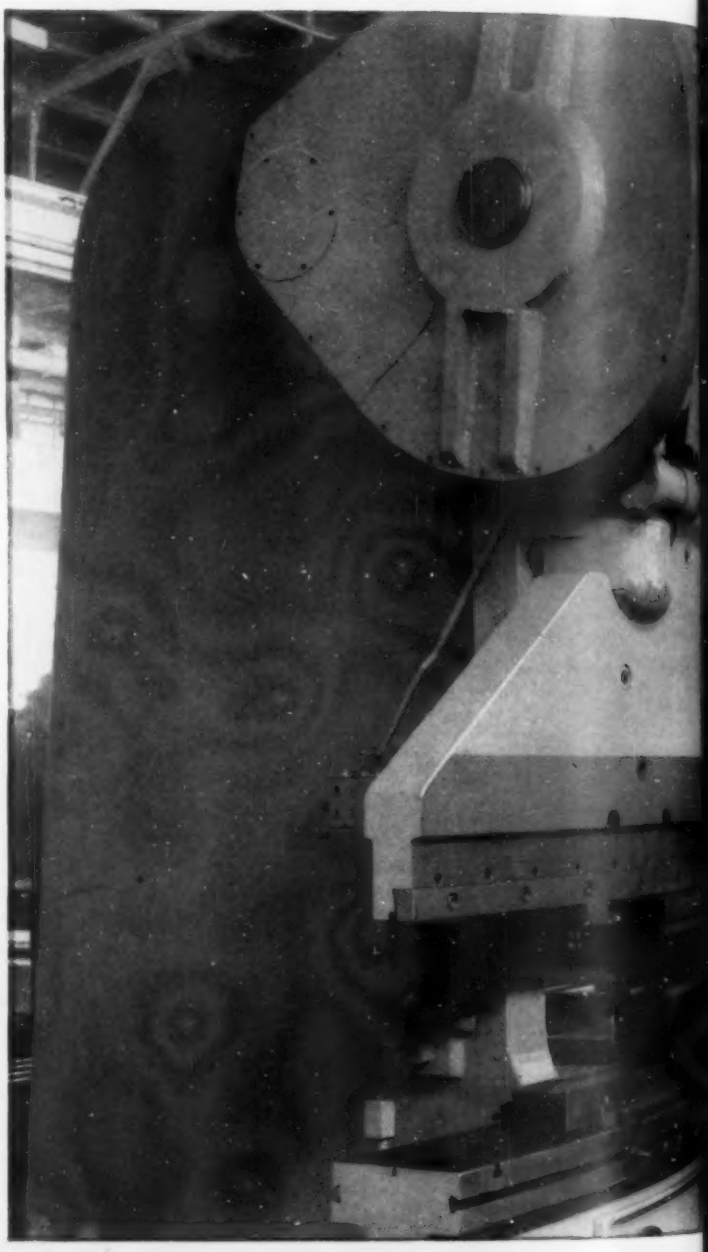


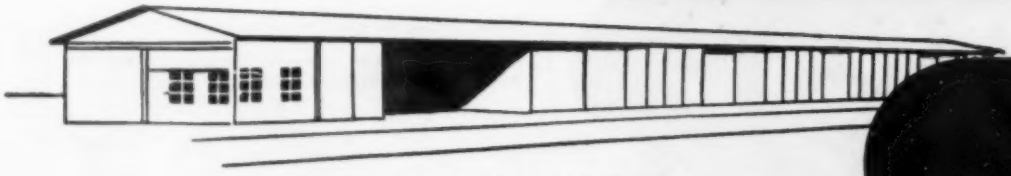
Barrier beam guard rail formed to any radius desired.

Flush panel metal door.



Formed structural bridge flooring

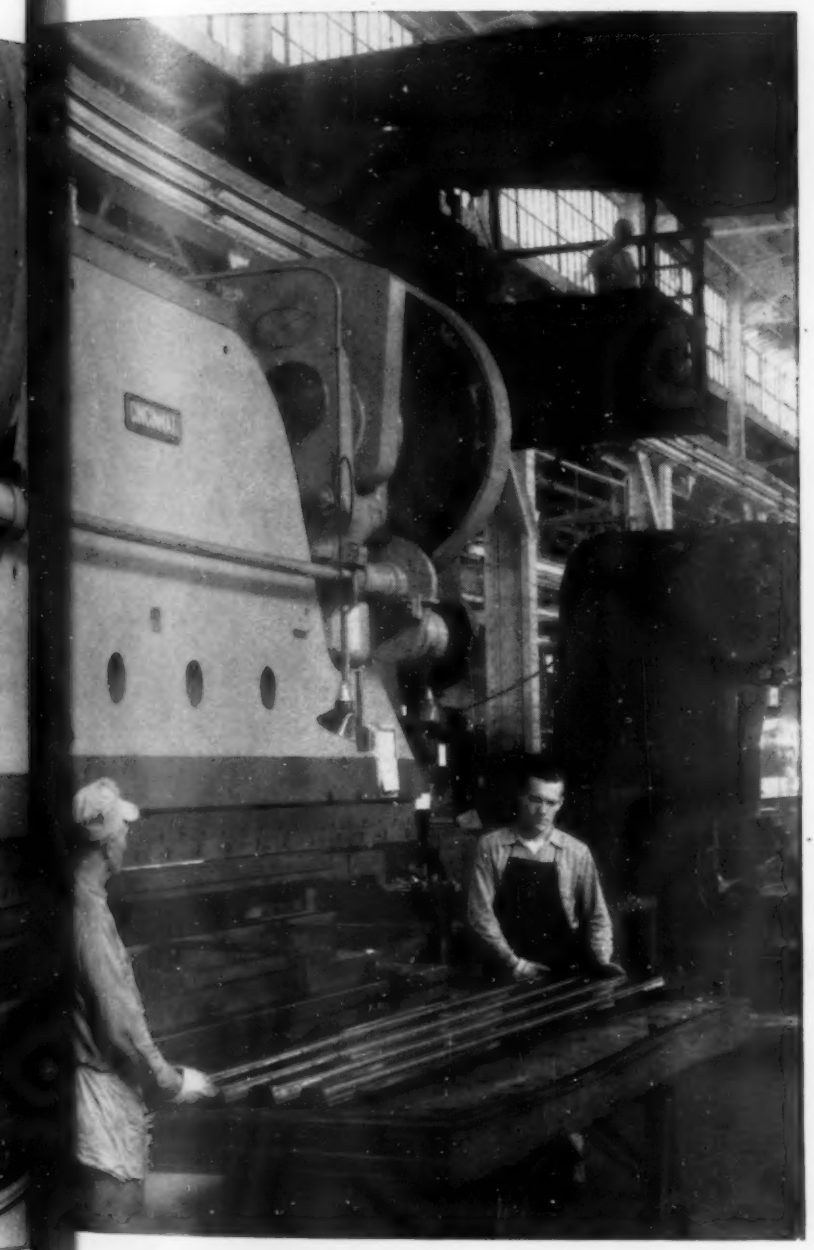


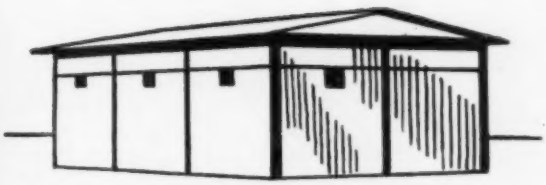


Permanent yet portable steel building

PRESS BRAKE

UNITED STEEL FABRICATORS, Inc.





All steel buildings of a thousand uses

WITH ample capacity, this powerful 500 Series Cincinnati Press Brake with 18′ 6″ clearance between housings and 22′ die area—handles formed structural bridge flooring, guard rails, steel doors. Girders and side walls for various types of metal buildings are also produced. United Steel Fabricators, Inc. are pleased with the accuracy in forming and ease and speed of operation which are important factors in this economical production.

INVESTIGATE:

—Cincinnati Center Line Loading

—Cincinnati Interlocked Construction

—Cincinnati Rigid Deep Beds and Rams

Write for the latest Press Brake Catalog B-4.

Photos courtesy of United Steel Fabricators, Inc., Wooster, Ohio

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

The name Jessop has been synonymous with fine quality steels for 170 years. Jessop metallurgists and production men pioneered many "firsts" in the specialty steel field. For instance, 53 years ago Jessop became the first producer of quality saw steels in the United States. Today, Jessop is making further strides in this field. It is one of very few domestic sources for periphery-rolled saw steel circles and ground and tempered steels for the manufacture of saws. There are several reasons for the consistent high quality of Jessop's saw steels. First of all, Jessop rigidly controls its melting formulas and pours ingots small enough for cross rolling. This assures a fine, uniform grain structure so that the stock blanks well, forms well, swages well, and has superior edge-holding properties. Moreover, though Jessop's tradition dates back to 1784, it is today a young, revitalized organization aggressively building new business on value received. The new Jessop team will give you better service and better delivery than you can expect elsewhere. Send in an order and find out how good this saw steel is.

JESSOP

STEEL COMPANY · WASHINGTON, PA.

Precision pressure control up to 5000 psi

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

Denison Pilot Operated Valves ...for relief, sequence, unloading and pressure-reducing

Denison Pilot Operated Valves provide precision control for your hydraulic circuits for any pressure need up to 5000 psi. With Denison Valves, pressure control is uniformly accurate because of a low differential between valve opening and closing pressure.

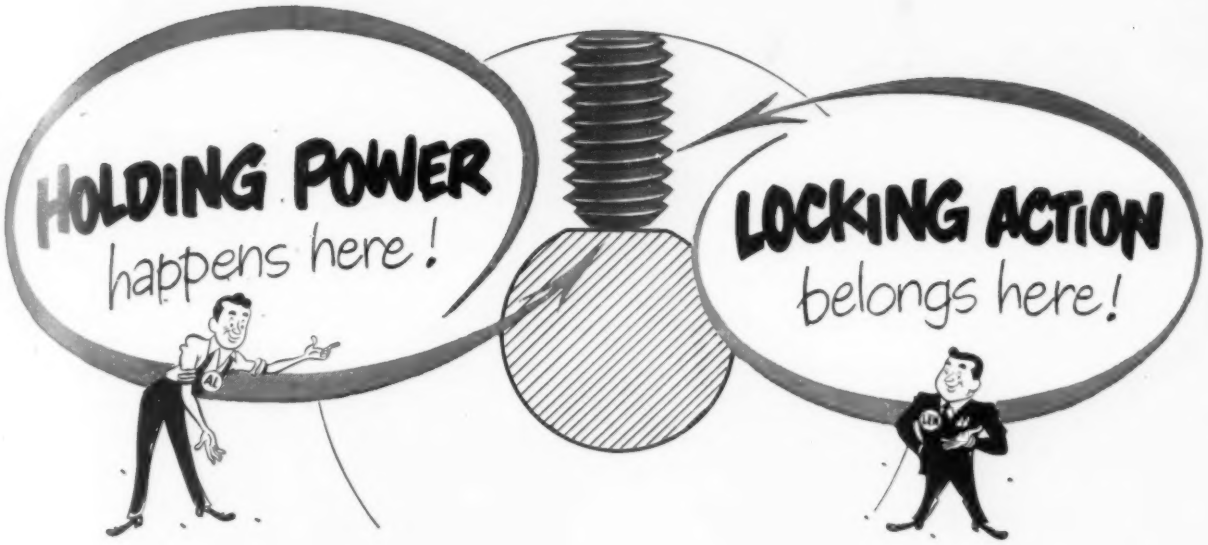
Valve action is chatter-free for efficient operation on high or low pressure applications.

A complete line includes relief, sequence, unloading and pressure-reducing valves . . . all hydrostatically balanced . . . ¾ to 1½-inch port sizes. Write for Bulletin VR-2C.

THE DENISON ENGINEERING COMPANY
1182 Dublin Road • Columbus 16, Ohio

DENISON TRADE MARK *Hydr OIL ics*

SPECIFY ALLENPOINT SET SCREWS BECAUSE



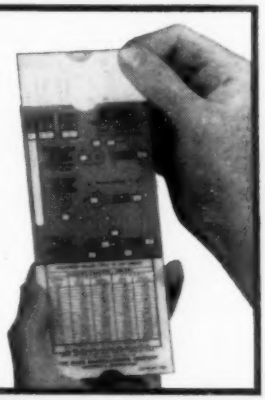
For maximum *holding power* against both rotation and sideway motion Allen developed the new *Allenpoint* — proved superior in exhaustive impartial tests (data on request).

Allen ○ screws do not weaken the holding power of the point with serrations in an attempt to make it perform a locking function too. High, uniform accuracy of fit, pitch diameter and perfect thread lead provide locking action the *right* way — from maximum thread contact. This locks the screw in place perfectly during use and *re-use* under extreme vibrating stress.

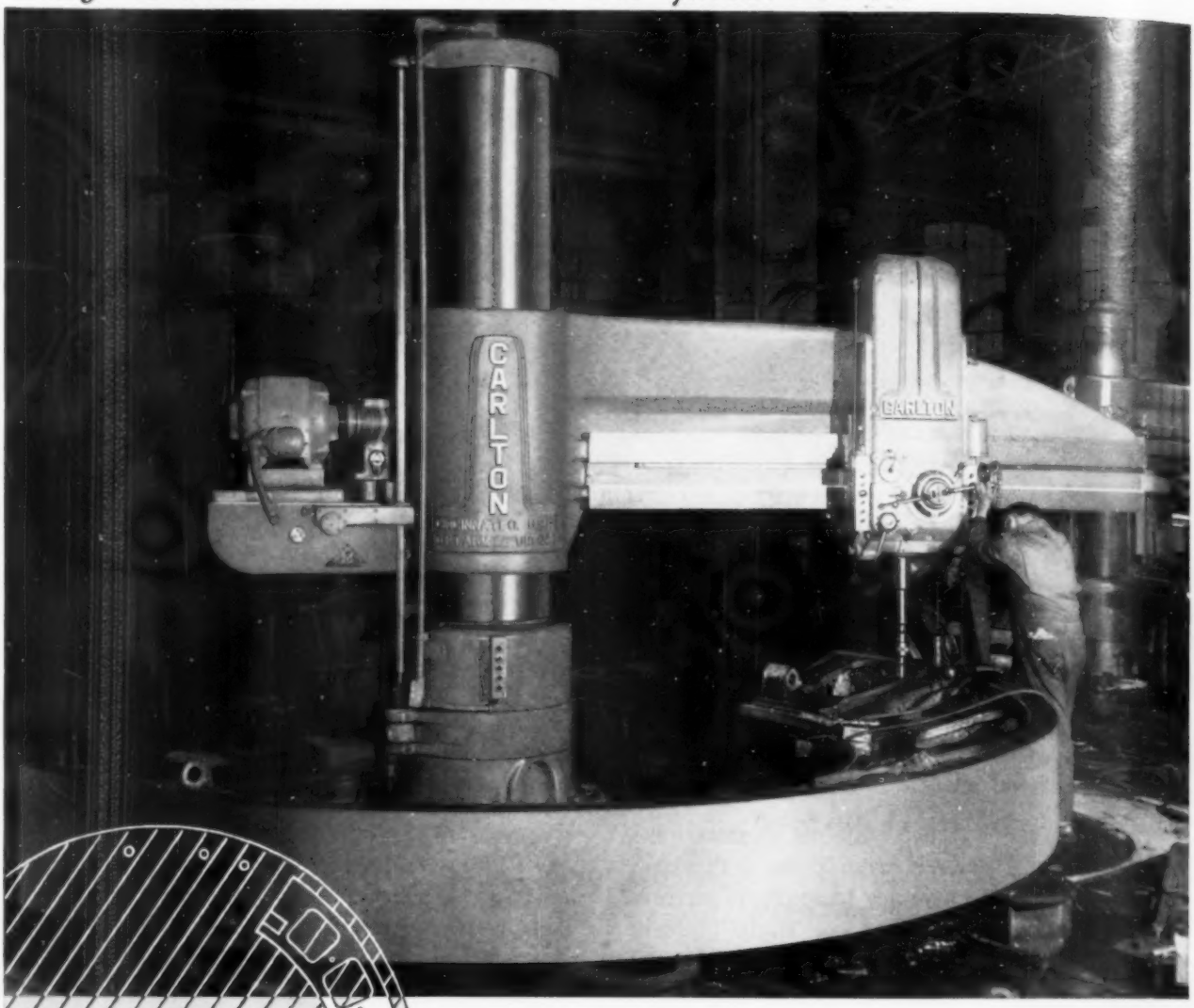
Your Allen Distributor's full stock of Allenoy and stainless socket screws puts an Allen warehouse right in your area. Allen-trained representatives plus Allen factory engineering bring a world of precision fastening experience as near as the phone on your desk.

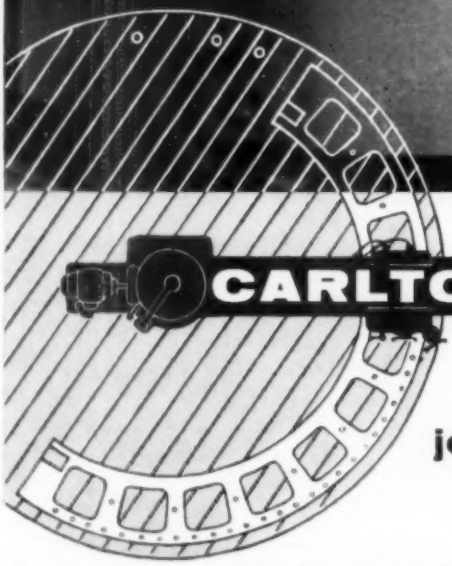
FREE —

New and improved pocket SCREW CALCULATOR. Write to Dept. G for it on your business letterhead.



Only **ONE** *can be called the finest.....*





CARLTON GETS AROUND...

...drills even the most difficult jobs easily, quickly and efficiently

Enormous capacity of the Carlton 5A radial drill (10-ft. arm, 26″ diameter column) allows you to drill all the holes in your large castings *at one setting*. This saving in reduced handling time is matched by precision accuracy – with Carlton you drill it right the first time.

You benefit in many other ways with Carlton radial drills: pushbutton control, super-precision column clamp, low-hung drive, positive tooth feed clutch and easy, economical maintenance. Check Carlton and you'll buy Carlton, the completely modern radial drill.

Arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. Send today for descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton

radial and horizontal drills

...m interchangeable parts...

Danly Die Set Service is Faster!

Choose the Danly Branch closest to you—

BUFFALO 7	1807 Elmwood Avenue
CHICAGO 50	2100 S. Laramie Avenue
CLEVELAND 14	1550 East 33rd Street
DAYTON 7	3196 Delphos Avenue
DETROIT 16	1549 Temple Avenue
GRAND RAPIDS	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
LONG ISLAND CITY 1	47-28 37th Street
LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
PHILADELPHIA 40	511 W. Courtland Street
ROCHESTER 6	33 Rutter Street
ST. LOUIS 8	3740 Washington Blvd.
SYRACUSE 4	2005 West Genesee Street

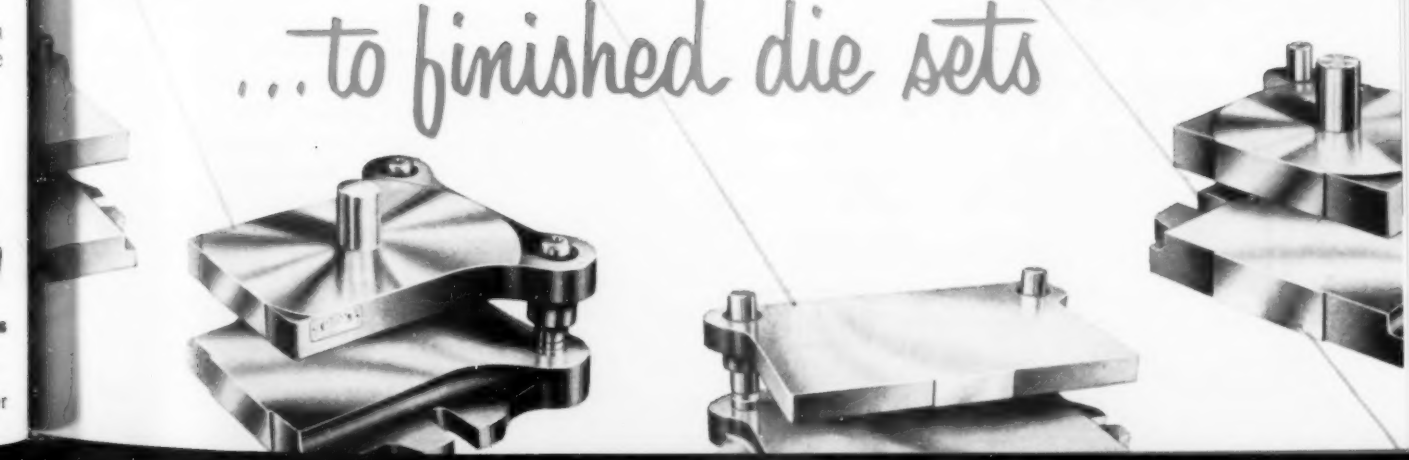
One of the main reasons for Danly's faster die set service is the *interchangeability* of die set parts achieved by Danly. It starts at the main Danly Plant where die set components are produced to Danly's traditional high quality, precision standards. The faster service cycle continues at all of the Danly Branch Plants where thousands of *interchangeable* die set components are stocked. The cycle is completed at the Danly Branch in your area where these parts are assembled as a die set to meet your specific requirements and shipped as soon as your order is received. So remember—for the best in die sets in the shortest time, the place to call is your local Danly Branch.

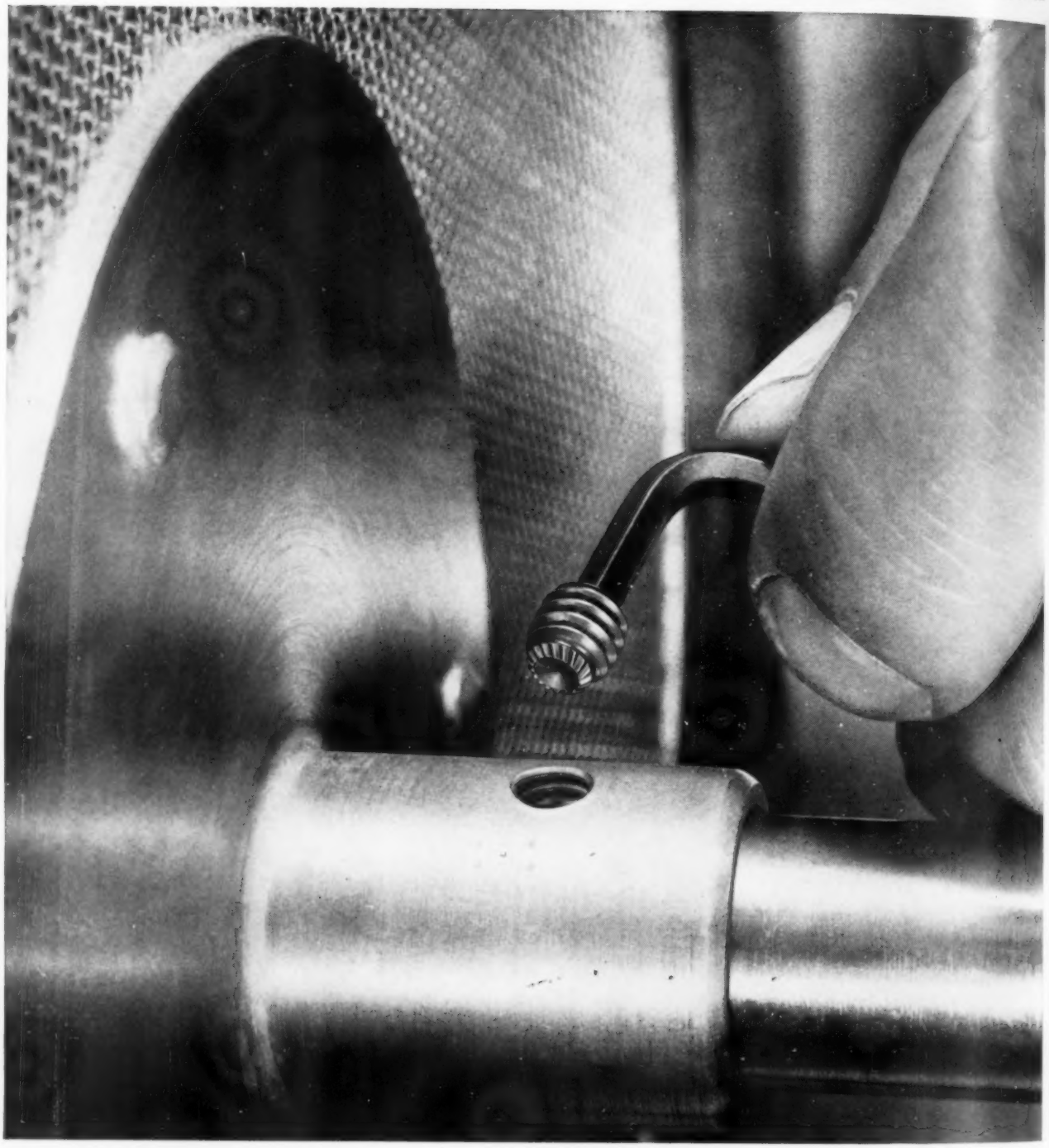
DANLY

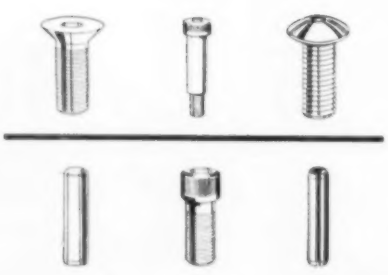
DIE SETS...
STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

...to finished die sets





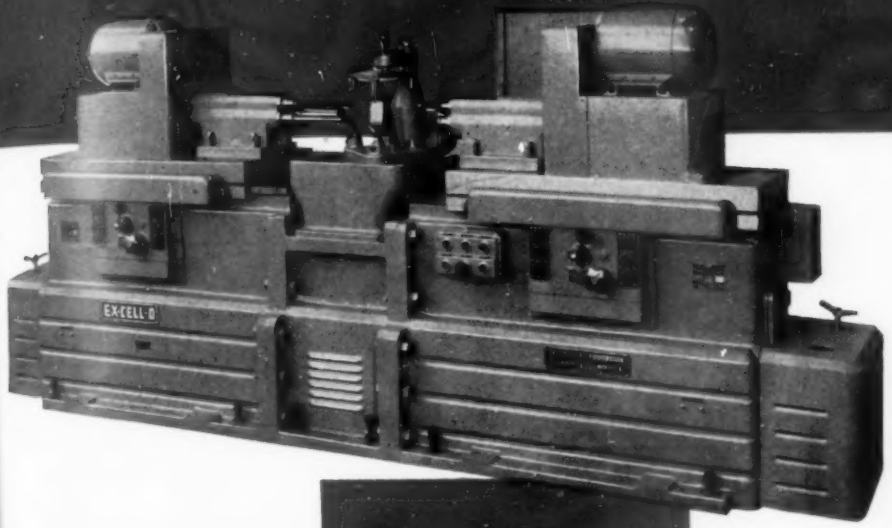


HOW TO KEEP A SET SCREW TIGHT. Tighten it as tight as possible. Keep it in place by preventing it from starting to work loose. With UNBRAKO Self-Locking Socket Set Screws you can do both. They are designed for the highest recommended tightening torques in the industry—as much as 45% higher than those used for ordinary socket set screws. UNBRAKOS have the unique knurled cup point which prevents them from starting to work loose, even in poorly tapped holes. For the complete UNBRAKO story, see your industrial distributor—or write STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

Modernize Today for Profits Tomorrow

WITH FAST, VERSATILE PRECISION WAY MACHINES

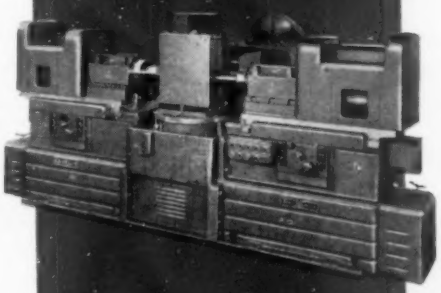


STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

STYLE 54 ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.

STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.



STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

54-3

EX-CELL-O

WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO

EX-CELL-O for PRECISION

BATH TAPS

Make Better Threads

because they are

Insist on BATH TAPS for BETTER THREADS

SHARP

Bath Taps have teeth with sharp cutting edges, capable of "putting the bite" on the toughest materials.

UNIFORM

Bath Taps of the same size, are exact duplicates . . . on the same order, or on a re-order.

ACCURATE

Threads are "right on the nose" . . . because Bath Taps have the proper pitch diameter, lead and angle.

RUGGED

Behind the ruggedness of Bath Taps, is the experience of years in the manufacture of tools that can "take it".

CONTROLLED

Every step in Bath Tap manufacture is controlled . . . rigid check-ups and routine inspections guarantee high performance standards.

DEPENDABLE

Bath Taps are especially heat treated before "grinding from the solid", to assure accuracy and dependability.

Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

JOHN BATH & CO., Inc.

28 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

Here's a New Time-Saving Tooling Idea!

COMPLETE STOCKS OF DAVIS BLANK-BAR FLYCUTTERS LET YOU TOOL UP FASTER BY MACHINING ANY SHANK OR PILOT STYLE DESIRED RIGHT IN YOUR OWN SHOP

Now at Davis you can choose from 11 different Super Micrometer-Adjustable Flycutter Tools—4 with 18 inches of blank bar on each side of the cutter, and 7 with unfinished shanks—and save a lot of tooling time and money by machining the bar sections to your own requirements.

Cutter adjustments to within 0.0001" are obtained by merely turning the dial of the simple, sturdy Davis micrometer mechanism. Both heavy roughing cuts and fine finishing cuts can be made with these versatile, precision tools.

Write for Bulletins DB 110 and 112.

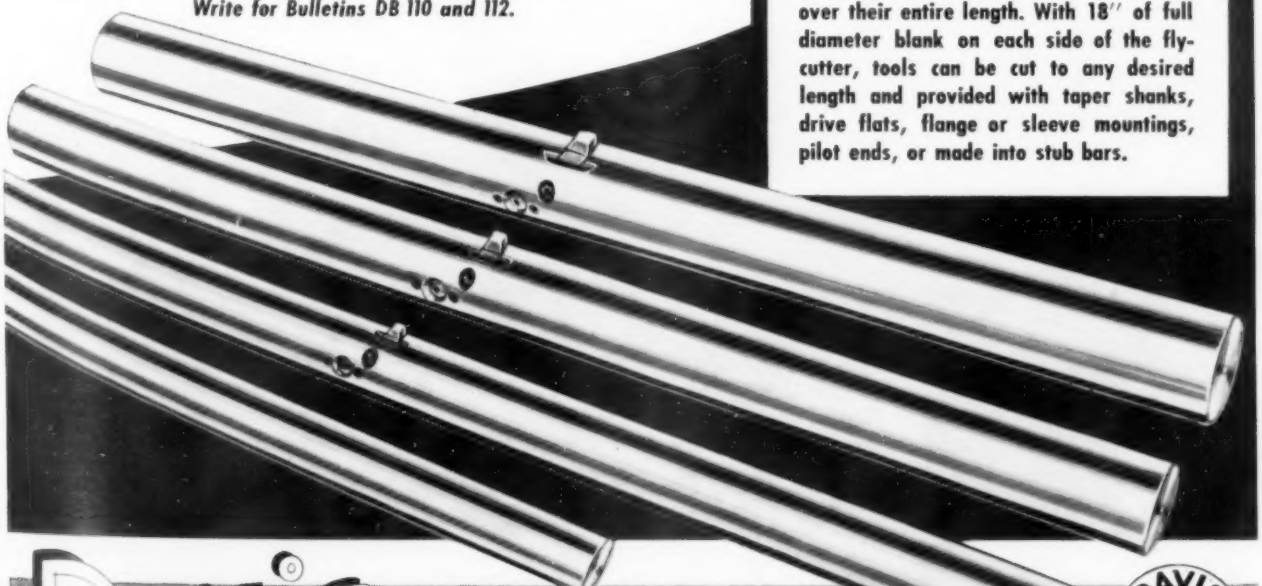
7 DIAMETERS OF UNFINISHED-SHANK STUB BORING TOOLS

Davis Stub Boring Tools with Unfinished Shanks handle a range of bores from 1¼" to 7" diameter. Overall length runs from 12" to 19". Diameter and length of the unfinished portion provide ample stock for machining a shank exactly to fit your particular type and size of vertical boring mill, horizontal boring machine, engine or turret lathe, or radial drilling machine.

Immediate Delivery!

4 DIAMETERS OF 36" LENGTH UNIVERSAL BAR BLANKS

Davis Bar Blanks handle a range of bores from 1½" to 4⅝" diameter. Bars are finish ground with a tolerance of ±0.001" over their entire length. With 18" of full diameter blank on each side of the flycutter, tools can be cut to any desired length and provided with taper shanks, drive flats, flange or sleeve mountings, pilot ends, or made into stub bars.



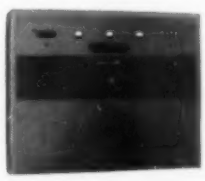
DAVIS BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Company
Fond du Lac, Wisconsin

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING

Hardened areas show darker at ends of rocker arm.

for accurate selective hardening of this rocker arm

...using a Lindberg 50 KW High Frequency Unit



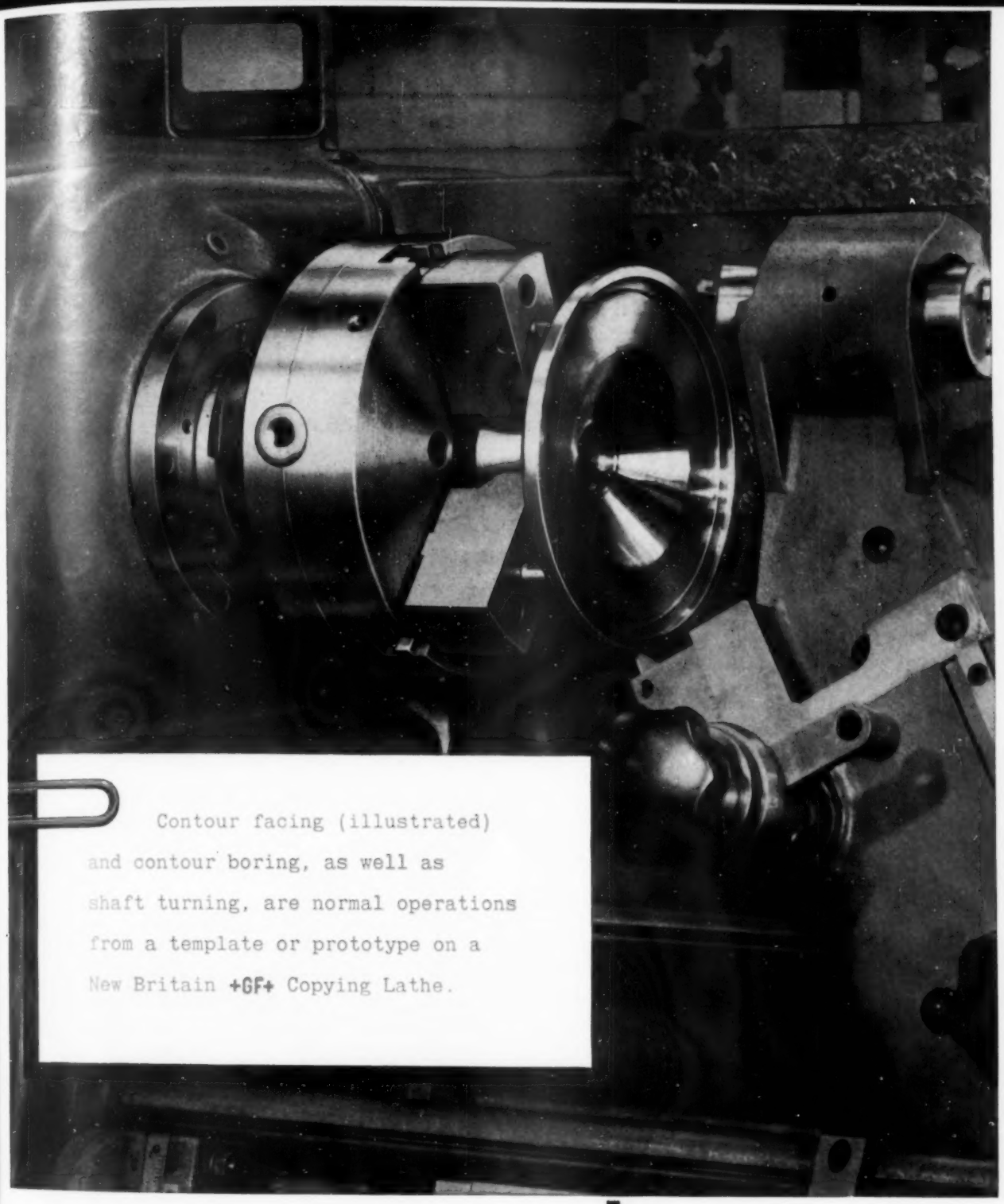
In Detroit, a leading manufacturer of prestige autos increased production of rocker arms 300% by switching to a Lindberg 50 kw high frequency unit with a new work fixture. Production is now 1550 per hour . . . with no rejects due to unit failure.

Selective hardening of these pearlitic malleable iron rocker arms provides wear resistance from valves and push rods. A sharp cutoff of the hardness is necessary because the center hole must be kept soft for further machining.

Lindberg high frequency units give continuous 24 hour a day operation with a maximum of dependability. If you have an induction heating application, you'd do well to talk things over with a Lindberg engineer.

LINDBERG  **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company • 2447 West Hubbard Street • Chicago 12, Illinois



Contour facing (illustrated) and contour boring, as well as shaft turning, are normal operations from a template or prototype on a New Britain +GF+ Copying Lathe.

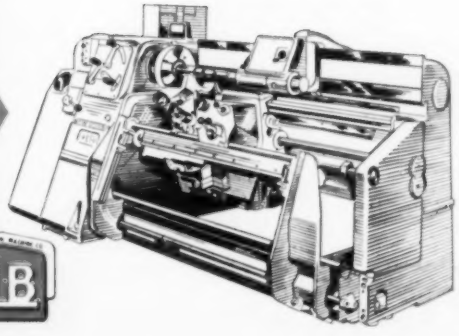
THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

NEW BRITAIN Automatics

Machines for Making Progress

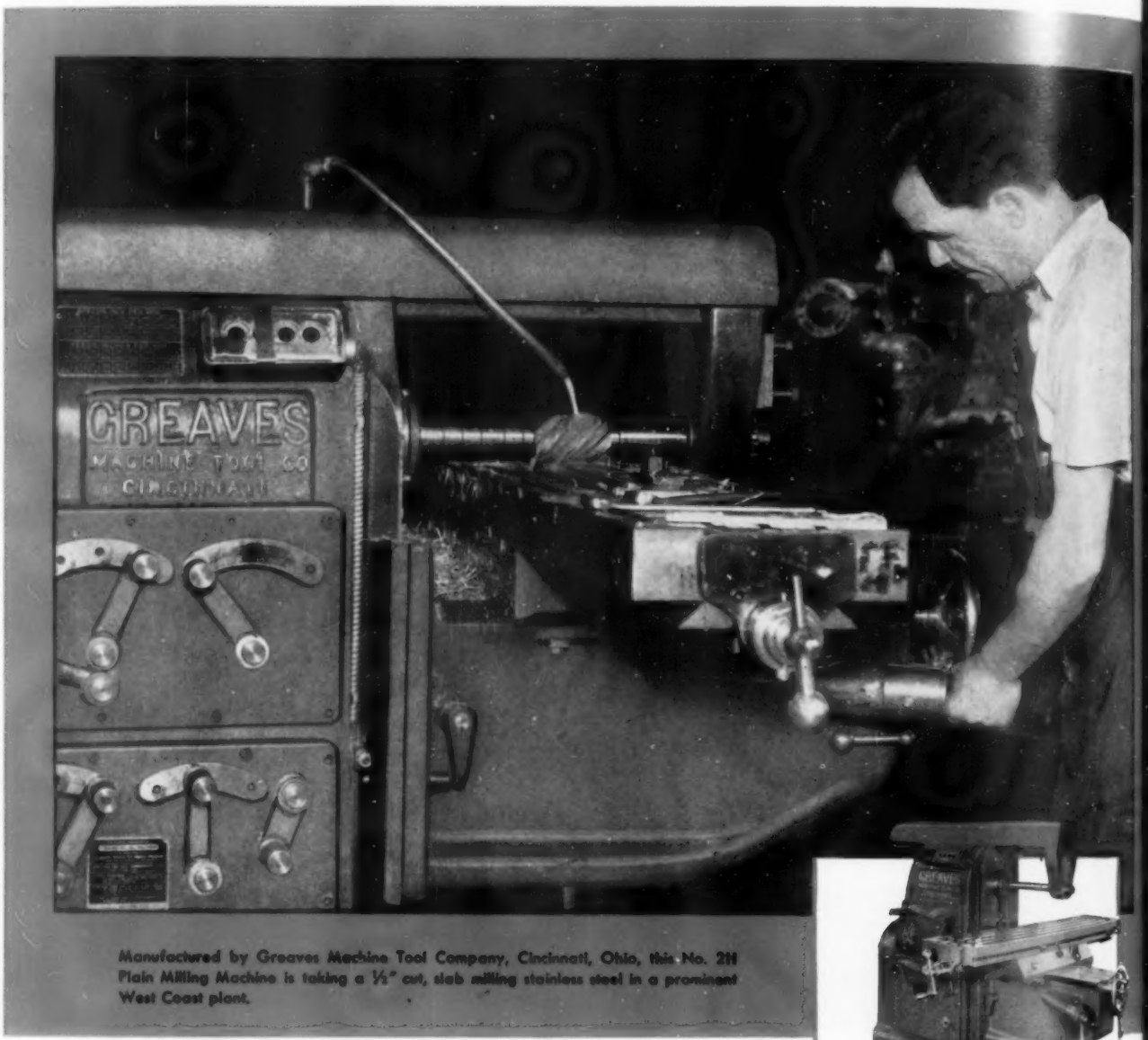
Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-47

Takes ½ inch cut in stainless

SCULLY JONES Precision



Manufactured by Greaves Machine Tool Company, Cincinnati, Ohio, this No. 2H Plain Milling Machine is taking a ½" cut, slab milling stainless steel in a prominent West Coast plant.

Greaves No. 2H Plain Milling Machines "factory-equipped" with Scully-Jones Precision Arbors

On heavy slab milling cuts, it's important that each tooth in the cutter take its share of the load. That's why Greaves engineers specify Scully-Jones Style "B" *precision built* Arbors . . . the arbors that prolong tool life by eliminating runout, wobble, and chatter for efficient milling at maximum feeds and speeds.

steel...

Milling Arbor prolongs tool life!

For fast, accurate milling at lower cost, it pays to use Scully-Jones *precision built* Arbors!

You save tool life because your cutters always run true, each tooth taking its share of the load. Arbor and pilot diameters are held to +.0000″, −.0005″. Faces of spacers and sleeves are ground and lapped parallel within .0002″. Taper shanks are ground to a finish of from 10 to 20 micro-inches, RMS, and are individually checked on light gages to assure a perfect fit in the spindle.

You save tooling costs, too, because Scully-Jones Arbors are made to take a lot of punishment. Manufactured from steel forgings, they're tough on the inside to provide maximum strength and minimize vibration . . . hard on the outside to resist nicking and wear.

Call your factory-trained Scully-Jones representative or distributor for fast service on milling arbors, adapters, sleeves, and spacing collars . . . as well as other Scully-Jones "Precision Holding" Tools.

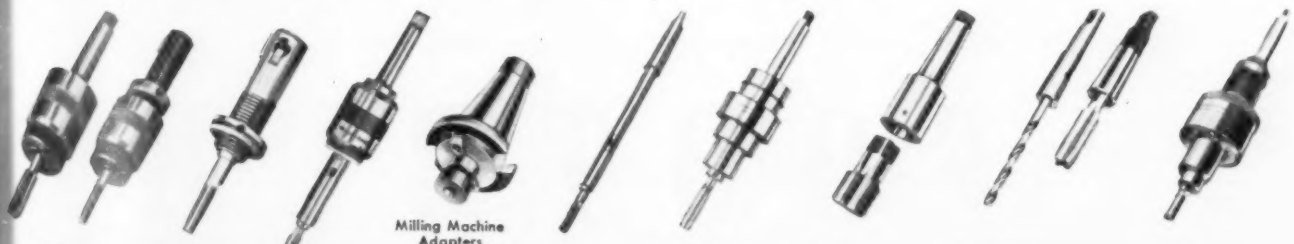
When you buy or *build* a machine tool, make sure it's equipped with Scully-Jones "Precision Holding" Tools.

SCULLY-JONES

"Precision Holding" *for holding precision*

Scully-Jones and Company, 1915 So. Rockwell St., Chicago 8, Ill.

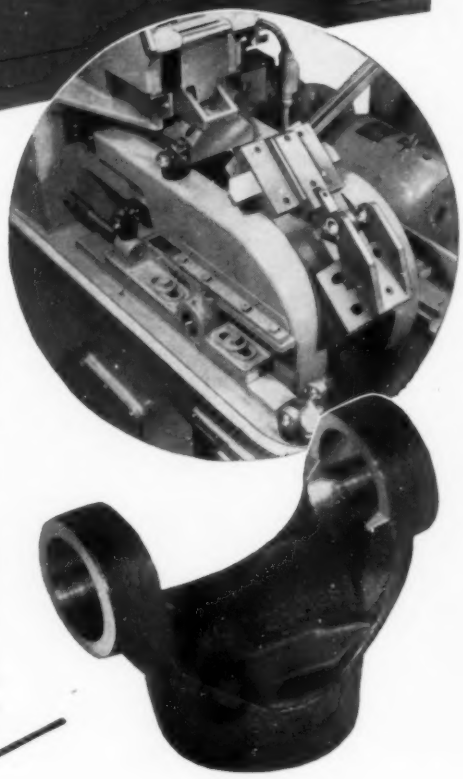
THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING AND DRIVING NEED



Holding fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.

to cut machining costs
machine faster with

CONTINUOUS BROACHING

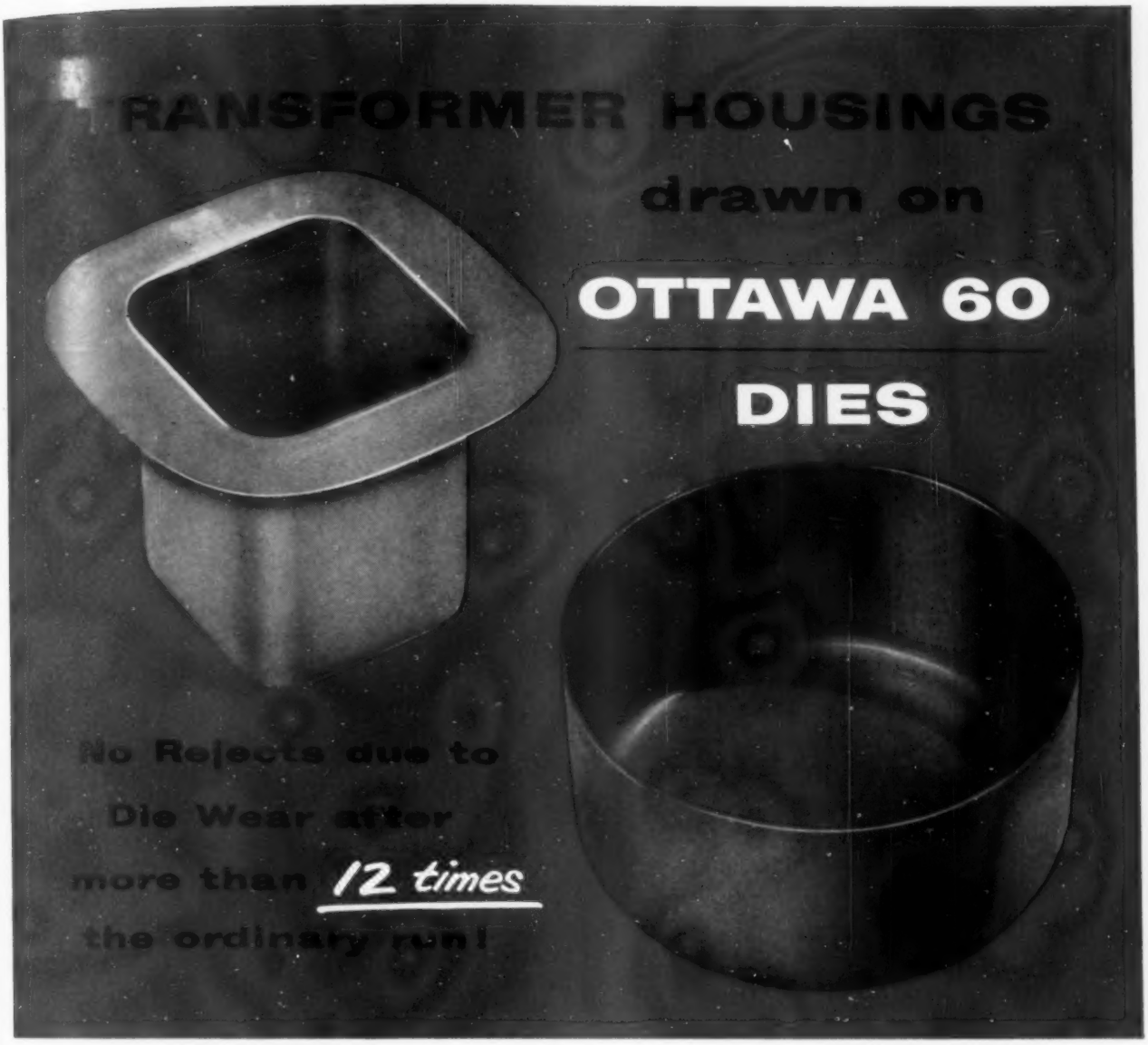


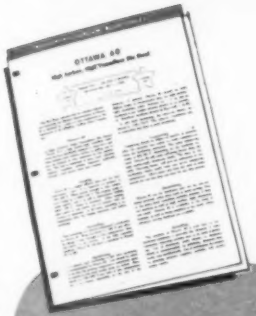
• Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

☆engineered for production

FOOTBURT
MACHINE TOOLS





Write for a copy of the OTTAWA 60 BLUE SHEET

This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.

ADDRESS DEPT. TE-62

OTTAWA 60 is a *new* die steel, an A-L "original," developed primarily to deep draw and form stainless steel. As intended, it performs without galling or pickup and shows exceptional wear resistance in that service. We have plenty of case histories to show you in proof.

But *wherever* you use Ottawa 60 draw dies—not just on stainless steel—this high-carbon, high-vanadium alloy comes through for you. Illustrated above are the first and second draws on transformer housings, produced from .037" gauge SAE 1010 strip. The company formerly used dies made of 5% chrome air-hardening die steel—and later a more highly alloyed material—without ever getting more than about 2000 pieces before the dies began to show gall marks and pickup, and parts were rejected due to scoring, breakage and oversize. *Dies made from Ottawa 60 forgings cured that! Results after 25,000 pieces showed no pickup and no wear on punch or die.*

● You can solve many a problem and save real money with Ottawa 60 draw dies! Write for information or call in our Field Service Staff to help you get started. ***Allegheny Ludlum Steel Corporation, Oliver Bulding, Pittsburgh 22, Pa.***

For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 5463

AL® FINE TOOL STEELS SINCE 1854

drilling costs ...

---with more mass production features!

---with more cost reduction features!

ALREADY proved in use, the new Dumore Automatic Drill Unit is engineered to *earn* more and *save* more on the production line. It's designed for simple mounting in any position or combination . . . and to step up drilling operations. But let the features speak for themselves!

★ Easy mounting in any position.

★ Built-in controls for manual, semi-automatic and automatic operation.

★ Positive, no-slip spindle drive with ten selective spindle speeds.

★ Economical low-air-volume operation.

★ Air and hydraulic systems completely separate — easy maintenance.

★ Keeps tooling simple — tooling costs low.

★ Individual unit control provided in multiple unit setups — for rapid tool changes or job conversions.

★ When mounted on a standard drill press column, the unit becomes a self-contained, automatic drilling and tapping machine.

★ Full 3" stroke with depth adjustment to within ± .001".

★ Built-in auxiliary circuits for automatic activation of transfer equipment, indexing fixtures, other drill units for sequence operation in multiple setups.

PLUS these special operating features obtainable with Dumore accessories:

★ *Dumore Repeat Cycle Timer* — for *automatic stage drilling and tapping* of deep holes — providing automatic chip clearance, better holes, less drill and tap breakage.

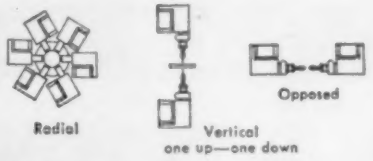
★ *Dumore Hydraulic Control* (optional) . . . for quick insertion or removal. Provides rapid approach, controlled feeds through work.

★ A variety of mounting accessories is available for adapting to existing or specially designed equipment.

Specifications: Dumore Automatic Drill Unit
WIDTH: approx. 9½" • HEIGHT: approx. 15" • LENGTH OVERALL: (incl. chuck) 24" • WEIGHT: (incl. motor) approx. 88 lbs. • FEEDS: Adjustable from 25 to 400 lbs. thrust. • RAPID APPROACH RATE: Adjustable up to 600-in. per min. (Distance adjustable from 0" to full stroke.) • AVAILABLE MOTORS: ½ to ⅓ HP; constant speed, continuous duty.

Get all the details! Send for descriptive bulletin today!

Mount the Dumore Automatic Drill Units to fit your needs



DUMORE
PRECISION TOOLS
Racine, Wisconsin

FOR FURTHER INFORMATION; USE READER SERVICE CARD; INDICATE A-2-53

More than meets the eye

P-K Socket Screws, at a glance, may look substantially like those you buy from "habit." You have to "look *beyond* the hex" for the difference.

If you don't, you are buying with a "blind spot" that can block your way to *proved* benefits other buyers are using to advantage. Parker-Kalon's exacting Quality Control is only one of the advantages you don't see until you "look beyond the hex."

Look Beyond the Hex

Compare every detail of product and service. Compare for advanced design . . . for proved assembly strength . . . for buying aids, and supply service. Get all the facts, and try P-K Socket Screws. You'll find they take top rating in any test.

Get samples, information from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick Street, New York 14, N. Y.

FOR TOP QUALITY and tolerance gaged to your most exacting specifications — and guaranteed.

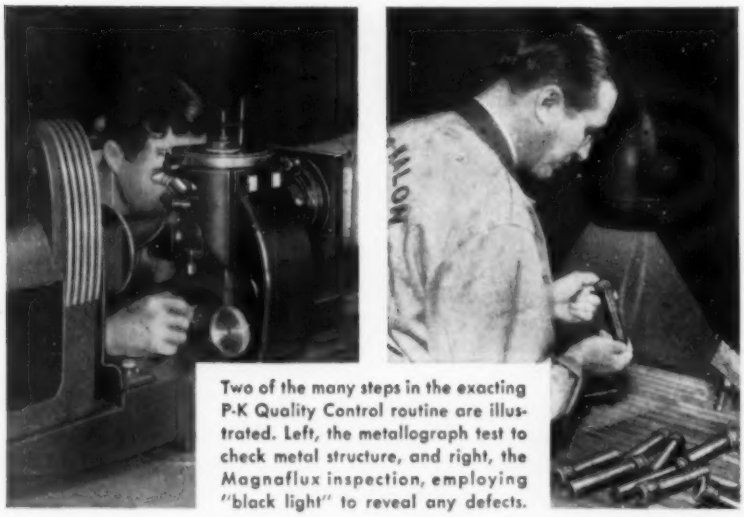
FOR ADVANCED DESIGN that speeds assemblies — makes them simpler, stronger — and saves errors.

FOR ASSEMBLY STRENGTH okayed in a million punishing tests by thousands of satisfied users.

FOR PLANNING AIDS and buying data patterned to your special needs, plus advice on assembly.

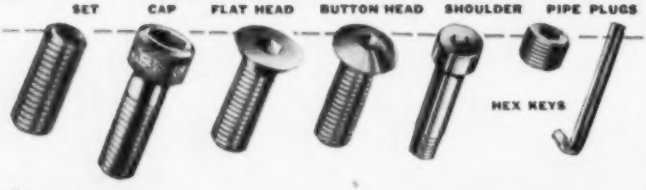
FOR SUPPLY SERVICE set up for fast action and lower purchasing expense — by local Distributors.

FOR ANY STYLE OR SIZE You'll find any Socket Screw you need in P-K's complete line. Hex Keys in all sizes, and several handy sets.



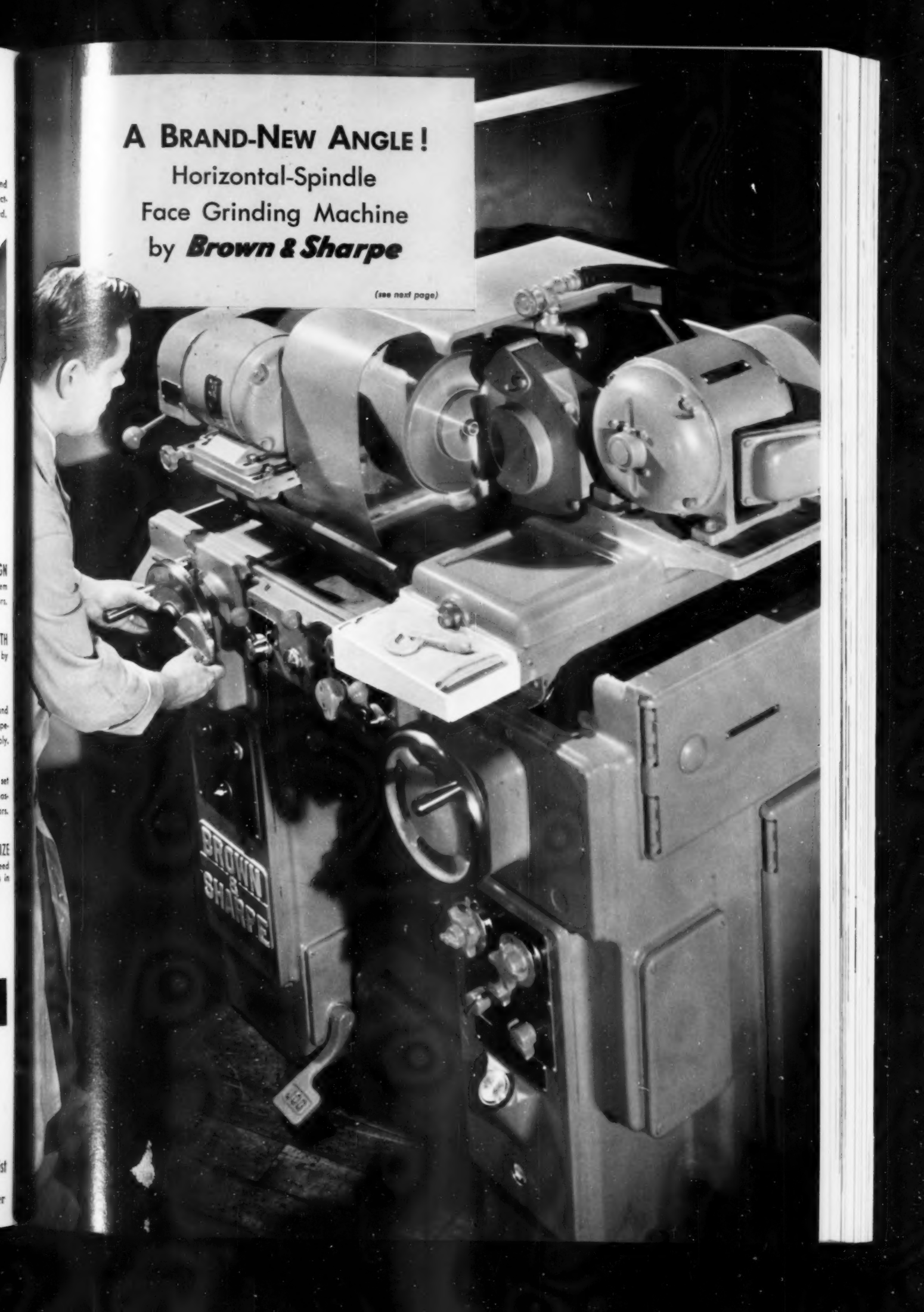
Two of the many steps in the exacting P-K Quality Control routine are illustrated. Left, the metallograph test to check metal structure, and right, the Magnaflux inspection, employing "black light" to reveal any defects.

PARKER-KALON SOCKET SCREWS



GET ALL THESE ESSENTIALS OF COST-WISE ASSEMBLY GET P-K

In Stock . . . see your nearby P-K Distributor . . . your local Supply and Service Specialist

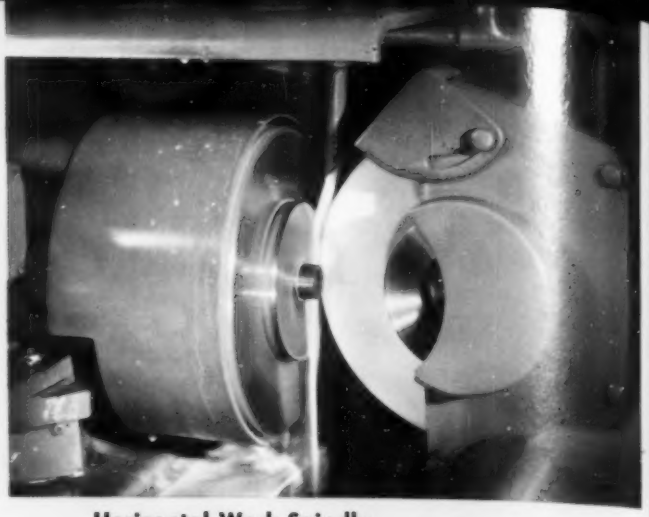

A BRAND-NEW ANGLE!
Horizontal-Spindle
Face Grinding Machine
by Brown & Sharpe
(see next page)
BROWN & SHARPE

New-Type Brown & Sharpe Face Grinding Machine Combines **Exclusive** Operating and Production Features!

The New No. 11 Face Grinding Machine provides a brand-new approach to grinding of flat, concave, or convex work up to 10" diameter and 4¾" thickness. It rotates work on a horizontal axis as opposed to conventional vertical-work-spindle rotary grinders. This feature, combined with fast, lever-controlled chucking and Set-Diamond dressing, makes the No. 11 unsurpassed for high precision and easy operation.

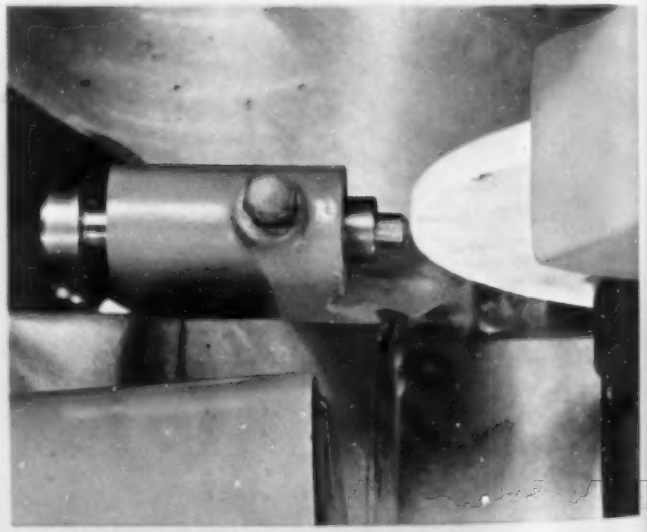
In addition, the No. 11 incorporates many other operating advantages such as: hand or hydraulic wheel slide reversal to .001"; hand or automatic work feeds at each reversal or forward reversal only; presetting of grinding and dressing speeds; work-holding by either permanent magnet chuck or face chuck.

These are only the highlights of this new *and different* face grinding machine. Write for complete information. Also ask for new booklet on our "Pay-As-You-Depreciate" Plan. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.



Horizontal Work Spindle
Aids coolant in thoroughly flushing grit from work and chuck . . . assures better surface quality.

Lever-Control of Work-Holders
Allows speedy chucking through-the-spindle . . . cuts non-productive time.



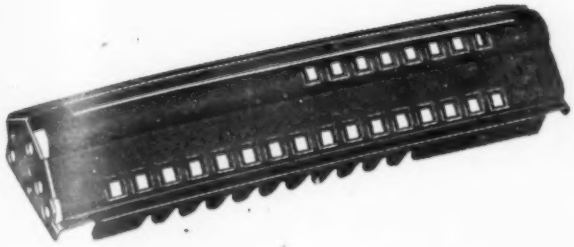
Set-Diamond Dressing (Viewed from above).
Faster, easier . . . eliminates need to re-establish wheel position for accurate sizing after subsequent re-dressings.

B·S

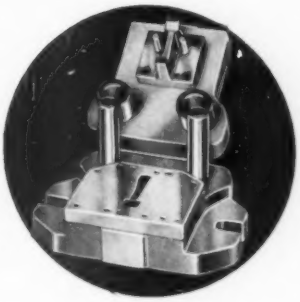
Brown & Sharpe

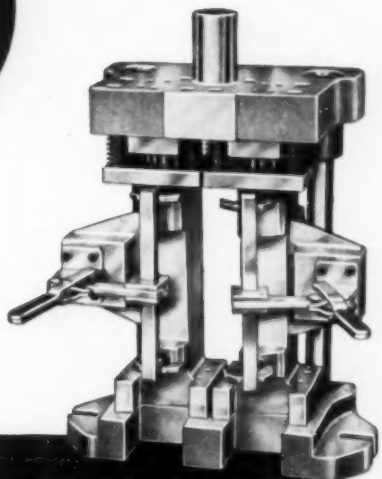
PRODUCTO *Catalog* DIE SETS

SOLVE SPECIAL STAMPING PROBLEM FOR MONROE



The Problem:
Stamping end-plate holes in the carriage cover of the Monroe Adding Calculator.

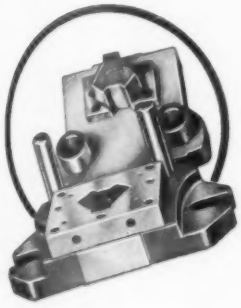


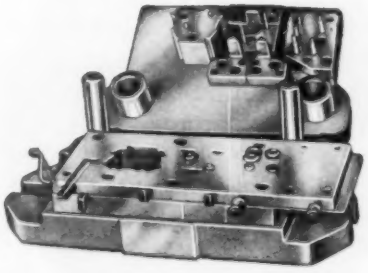


PRECISION

PRODUCTO

new design





THE DIE MANUFACTURER:
The Connecticut Tool and Engineering Co., Bridgeport, Conn.

The lofty die, at right, represents the last critical stamping operation in the production of the Monroe carriage cover, shown above. It's unusual because it pierces close-tolerance end holes in either 10″ or 12″ covers *after* they have been assembled. The die set that controls this precise piercing operation both looks and performs like a "special" made-to-order set. Actually, it is a rear pin catalog set fitted with 1¼″ x 16″ pins. Even with the long guide pins, the highly accurate parallelism is maintained. Yes, Monroe is getting the benefit of a "special" without paying for extras in time and expense.

In all, 12 Producto catalog die sets are used in stamping and forming this assembly. Only the one with the long guide pins is unusual in size or shape but *all* require the utmost in precision and dependability. The point to remember is this: Whether you require a "made-to-order" special or a "quick-to-order" catalog die set, you'll get the *best* from Producto.

FOR PRECISION DIE SETS *FAST* CALL...

THE PRODUCTO MACHINE COMPANY • 930 Housatonic Ave., Bridgeport 1, Conn.

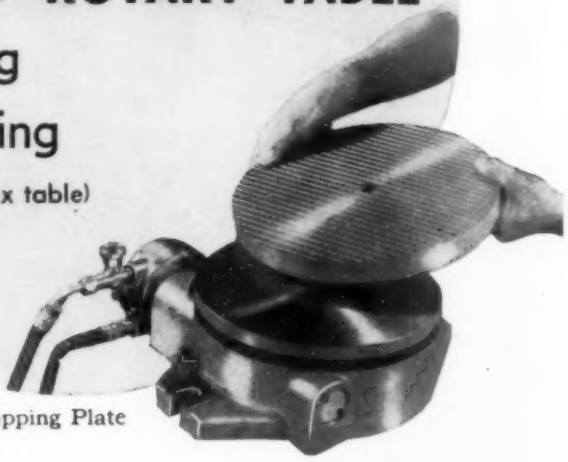
ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY. 3PD54A

With Permanent Magnetic Chuck

NEW *Vulcan* MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)



With Lapping Plate

FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*

Work clamped to motorized table, mounted on sine plate. Surface grinder application.

Major Vulcan Services

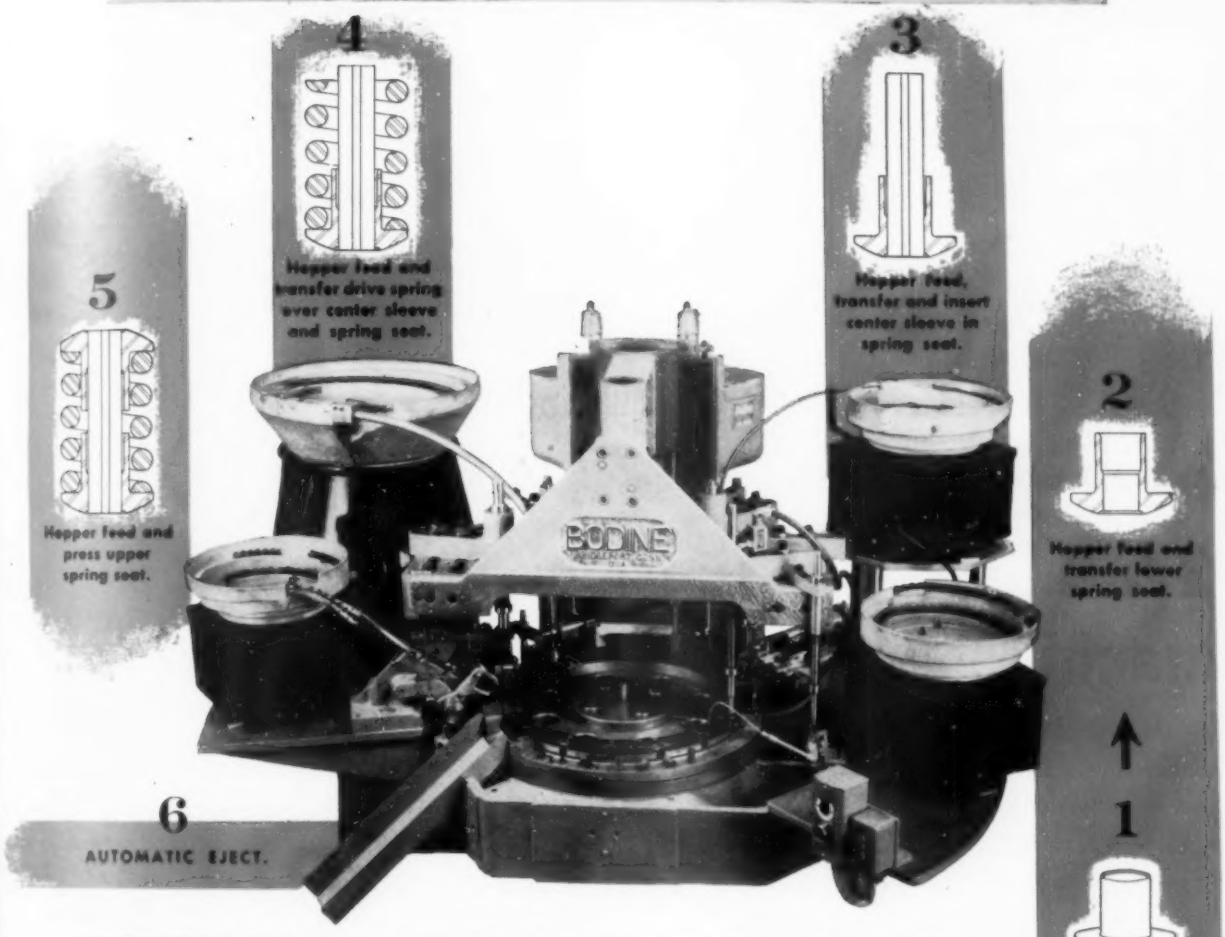
Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO.

7320 LORAIN AVENUE • DAYTON 10, OHIO

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING AUTOMATICALLY



PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write Dept. TE-2.

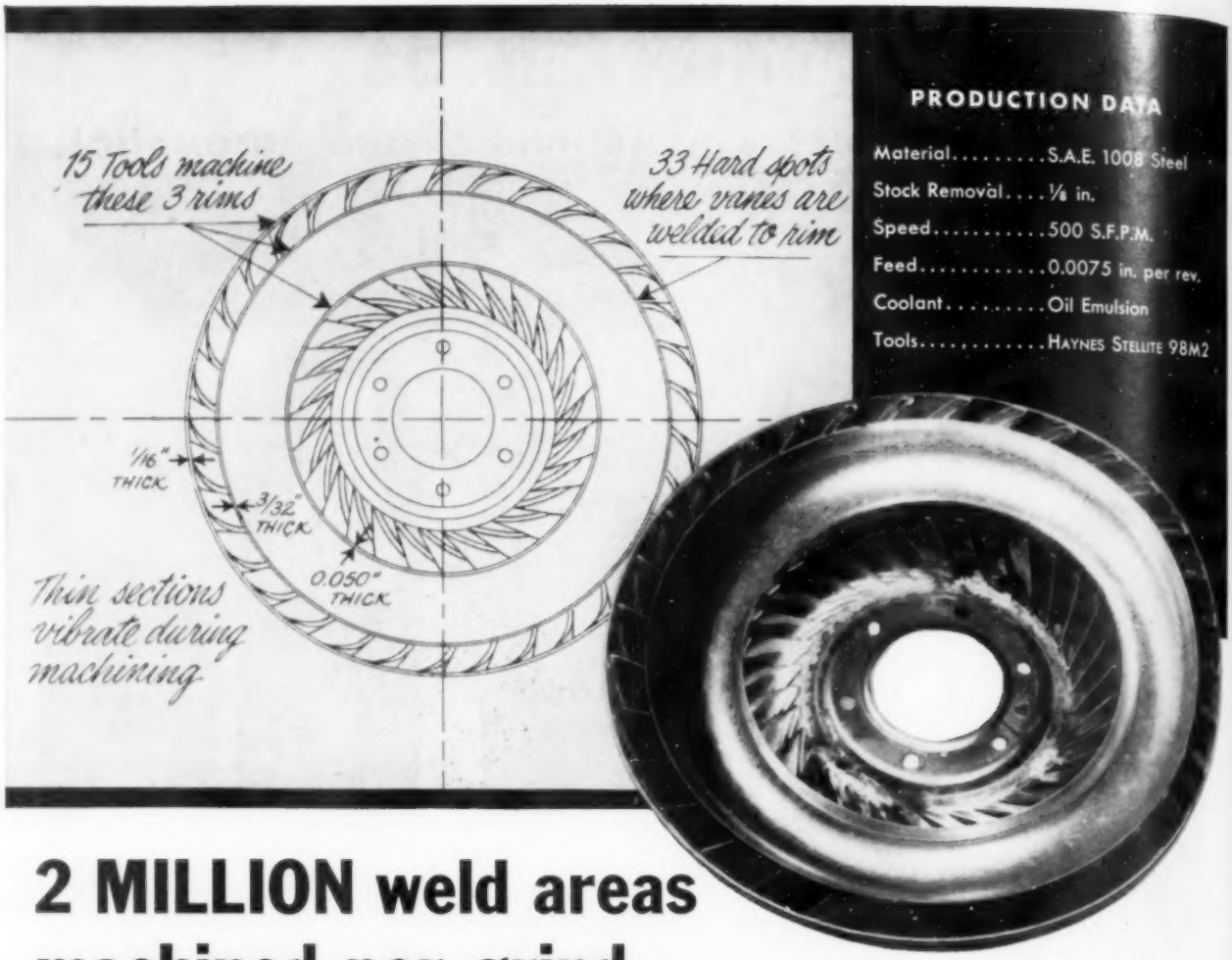
You Can't Meet Tomorrow's Competition

With Yesterday's Machine Tools

THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



PRODUCTION DATA

Material	S.A.E. 1008 Steel
Stock Removal	⅛ in.
Speed	500 S.F.P.M.
Feed	0.0075 in. per rev.
Coolant	Oil Emulsion
Tools	HAYNES STELLITE 98M2

2 MILLION weld areas machined per grind

HAYNES STELLITE 98M2 tools machine 1,000 of these torque converter turbine wheels between grinds. Fifteen tools are used to machine the three rims. There are 33 weld areas on one of the rims where the vanes are joined to it. On every revolution a HAYNES STELLITE tool cuts through these hard spots. It makes 2,100 interrupted cuts per wheel . . . over two million per grind. In addition, all 15 tools must withstand the shock set up by vibrations of the thin sections.

The parts are double indexed on an automatic lathe at six stations. Spindle speed is about 160 revolutions per minute. Feed rate is 0.0075 in. per revolution. Machining speed is 500 surface feet per minute. Total machining time per turbine is 28 seconds, and approximately 125 wheels are finished in an hour. The HAYNES STELLITE tools operate for a full eight-hour shift without chipping or spalling.

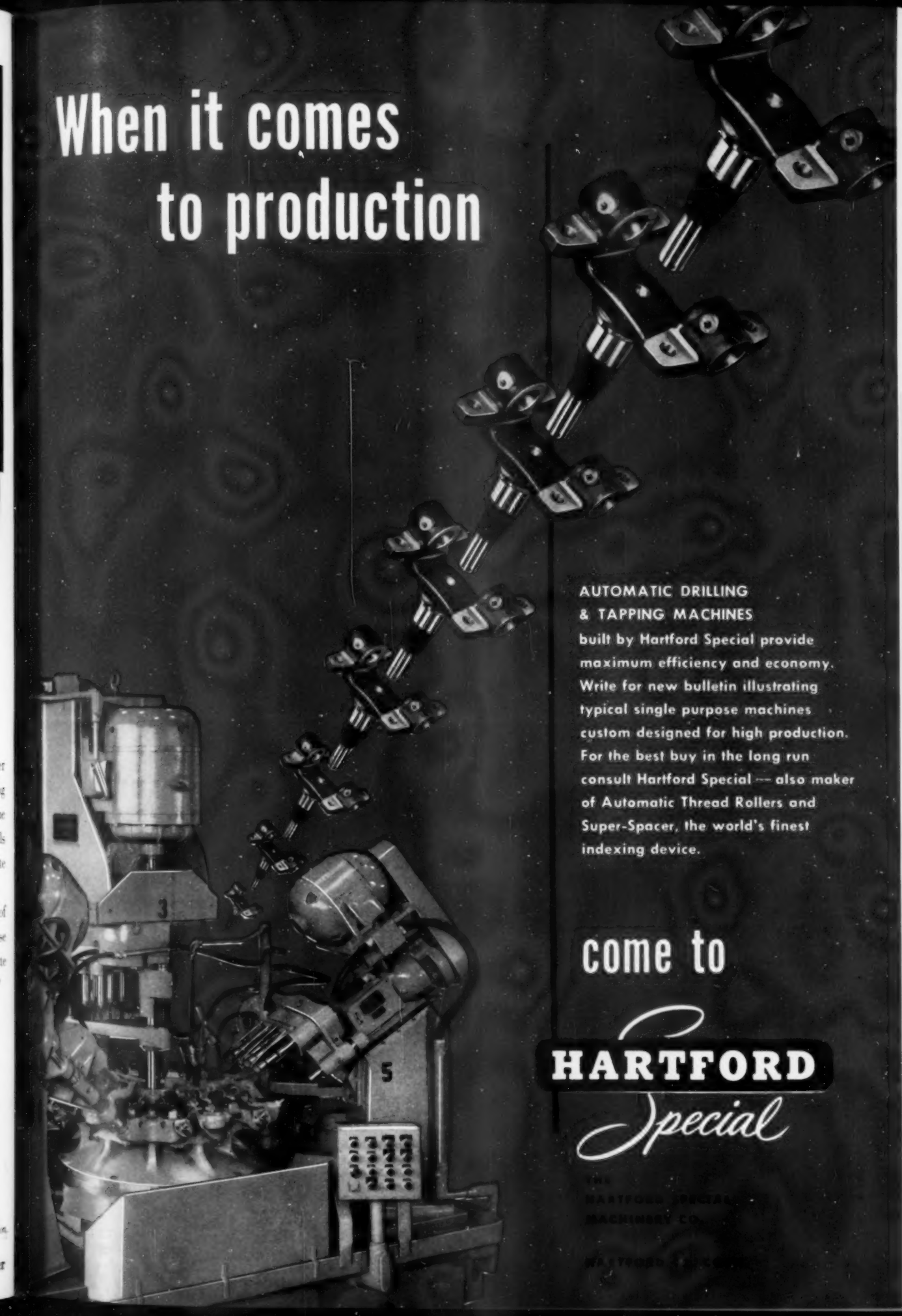
HAYNES STELLITE tools have an unusual combination of red hardness and toughness. They remove metal fast because they can take deep cuts at heavy feeds. For full details write for the booklet, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES
TRADE-MARK
ALLOYS

HAYNES STELLITE COMPANY
A Division of Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

"Haynes," and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

When it comes to production



AUTOMATIC DRILLING & TAPPING MACHINES built by Hartford Special provide maximum efficiency and economy. Write for new bulletin illustrating typical single purpose machines custom designed for high production. For the best buy in the long run consult Hartford Special — also maker of Automatic Thread Rollers and Super-Spacer, the world's finest indexing device.

come to

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO.

HARTFORD, CONN.

The precise pitch of this wire helix, in its glass tube, is accurately measured by Hewlett-Packard Company, using a Kodak Contour Projector.

to make the difficult easy

...the easy economical

Using the same contour projector, Hewlett-Packard checks spacing and parallelism of this special tuning condenser.

Hewlett-Packard relies on the Kodak Contour Projector

Here is an on-the-job demonstration of how projection gaging can solve difficult problems in inspection, slash costs in checking parts to close tolerances.

Using a Kodak Contour Projector, Hewlett-Packard Company measures the pitch of a precision wire helix for a unique electronic tube. Surface and shadow illumination provide a 20× enlarged image of the minute and delicate part. "Without the Kodak Contour Projector," say Hewlett-Packard officials, "it would not be practical to make the measurements necessary to get a satisfactory instrument."

Using the same contour projector, Hewlett-Packard also checks spacing and parallelism of a special tuning condenser for electronic test equipment. Conventional shadow projection provides a 10× enlarged image of the leaves. "Use of the projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

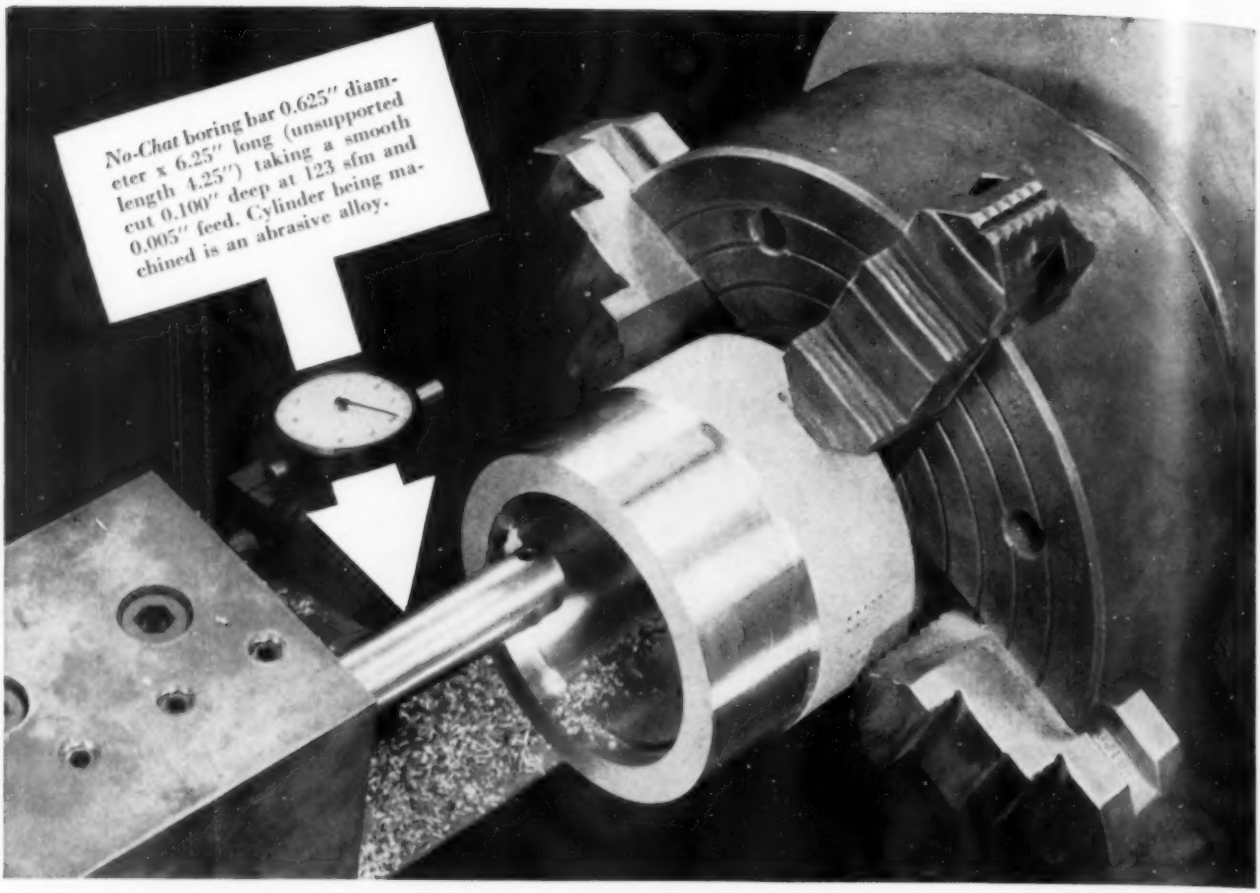
Diverse jobs like this are easily done with a Kodak Contour Projector. A twist of a dial provides whatever magnification is needed. A flick of a switch brings surface illumination to supplement shadow projection. Easy to see, isn't it, how a Kodak Contour Projector quickly pays for itself in use.

For more information on how you can use projection gaging in your own work, send for a free copy of "Kodak Contour Projectors."

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak



Tools vibrate less . . . last longer . . . with Mallory No-Chat boring bars*

Tool chatter can now be reduced as much as 50% and machining costs minimized, by means of *No-Chat* tool shanks and boring bars. Made possible by Mallory metallurgical research, this development offers improvements in cutting tool performance never before possible. It utilizes a high density alloy which is far heavier, more rigid and a better heat conductor than steel . . . and superior structurally to other heavy materials.

FINER FINISH is possible even on heavy cuts. Finish grinding can often be eliminated.

LESS DOWN TIME, especially important on multi-tool automatic machines, because tools last longer between grinds. Reduction of chatter minimizes wear of cutting edges. Better conduction of heat from the tip . . . three times faster than steel . . . makes tools run cooler and hold their edge longer.

BARS OF GREATER LENGTH-TO-DIAMETER RATIO can be used to minimize difficulties with boring operations . . . without fear of bar breakage. *No-Chat* boring bars are being used successfully to turn small internal diameters which formerly had to be finished by grinding. Our Technical Bulletin will give you full data on how you can utilize this new idea in the tools you design. Write for a copy today.

*Trade-mark
Patent Applied For

***Expect more . . . Get more from* P.R. MALLORY & CO. Inc. MALLORY**

In Canada made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

P. R. MALLORY & CO. Inc.
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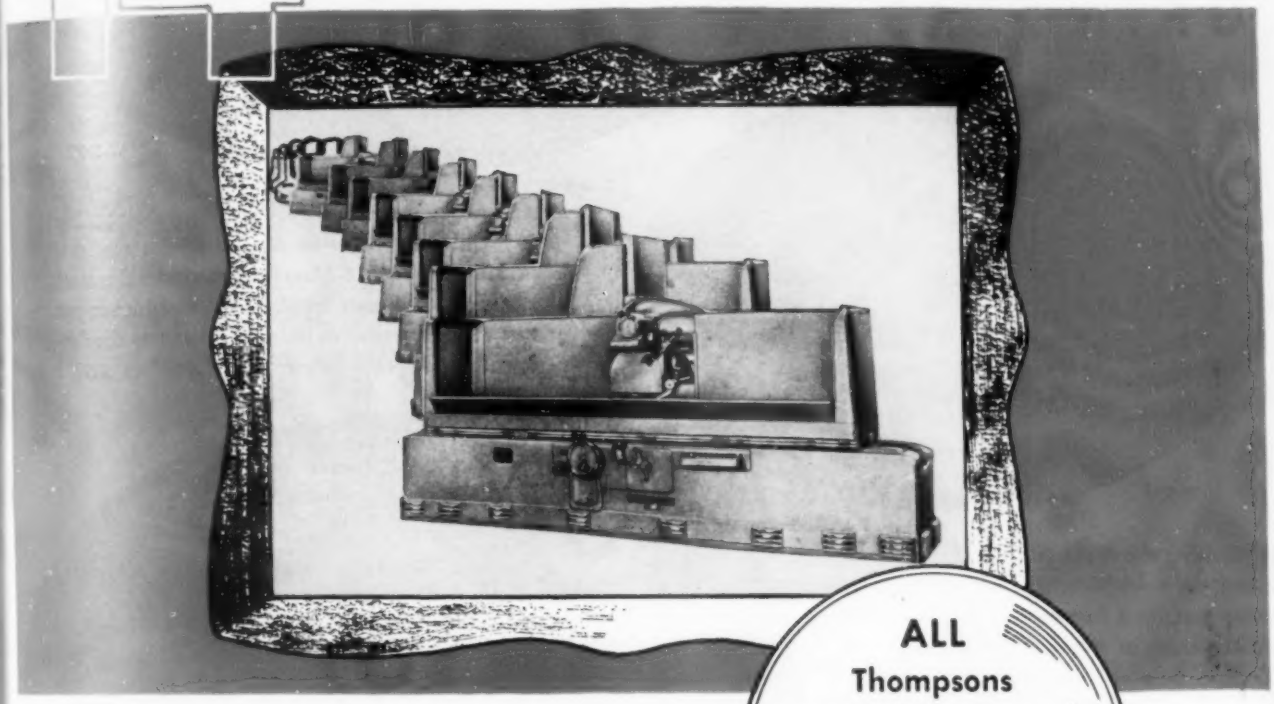
Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

For information on titanium developments contact Mallory-Sharon Titanium Corp., Niles, Ohio

LOOK CLOSELY AT THIS PICTURE
OF GRINDER PRODUCTION AND SEE WHY...

14 is a lucky number

for a manufacturer requiring precision grinding



ALL
Thompsons
operated continuously
with much
LESS
DOWNTIME

thats why

it will pay you
to invest in

Thompson Grinders

After twelve years continuous manufacture of precision ground products, ten Thompson Surface Grinders proved so efficient and economical that this manufacturer ordered four more machines.

Thompson Grinders are available in a wide range of types and sizes from 6" x 18" to 72" x 384" to meet all production, special or tool room grinding requirements. The Thompson line includes machines from giant Hydrial Way Grinders to automatic Truform Jet Blade Contour Grinders, Dual Rotary Grinders and Broach Grinders.

CONTACT THOMPSON TODAY FOR HELP WITH YOUR MACHINING PROBLEMS

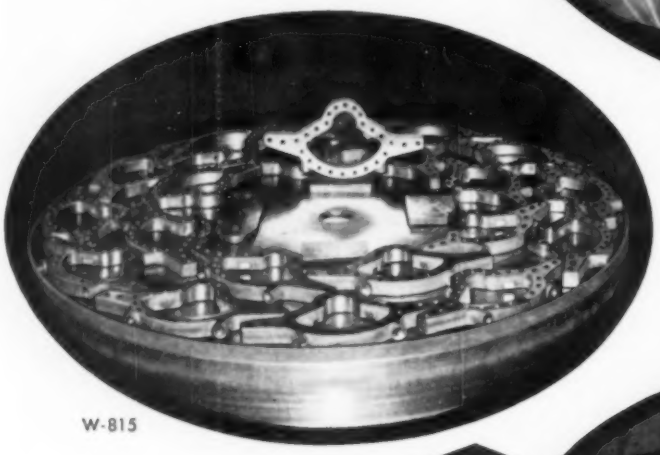
THE THOMPSON GRINDER COMPANY
Springfield, Ohio

Grind Costs to a Minimum!

with BLANCHARD SURFACE GRINDERS

W-1102

Blanchard surface grinders are noted for their ability to save time and labor in machining flat surfaces. For example, a No. 18 Blanchard machines the steel blocks shown above at the rate of 4 cubic inches per minute . . . and produces finished tolerances for flatness, parallelism and dimension of .001" to .002"!



W-815

By dressing the chuck and using the correct wheel, the same Blanchard will finish grind pump parts to a flatness of .0002" . . . with surface finish of 4 to 6 micro-inches . . . at a rate of 40 pieces (80 surfaces) per hour!

W-802

Blanchard ground to make *tight* joints! These valve plates are used in refrigerator compressors.

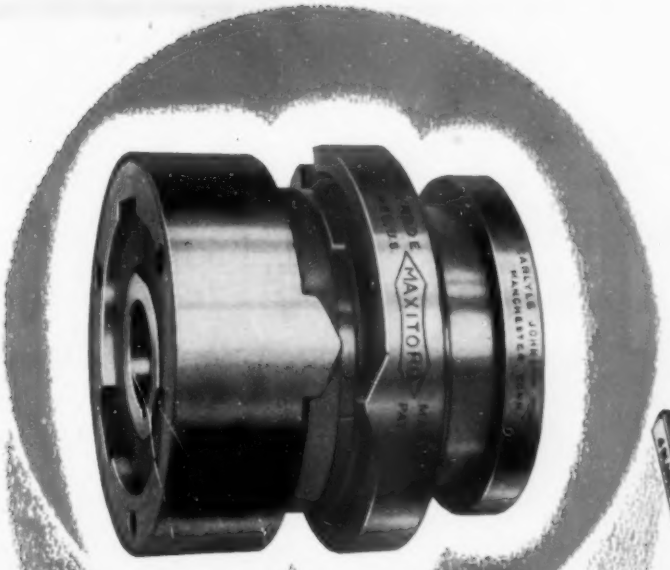
No. 18 Blanchard Surface Grinder

Obsolete machining methods often result in high costs and low profits. If you are not getting maximum production, consider using Blanchard surface grinders. They're economical, extremely accurate and highly productive on a wide variety of jobs. And they enable you to make a decent profit at competitive prices.

Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



MAXITORQ

Overload Release

CLUTCH

minimizes machine Down-Time

AT THE

GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

"The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.

"Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

SEND FOR CATALOG NO. TE-2

8CJ53

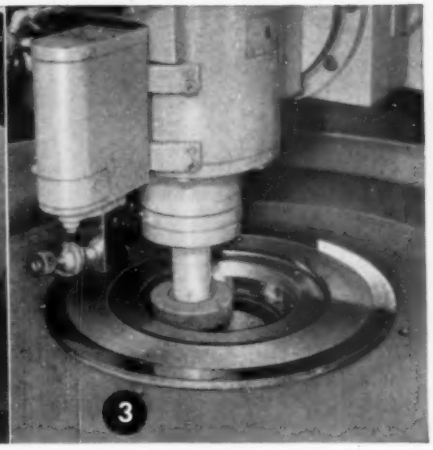
THE CARLYLE JOHNSON MACHINE COMPANY

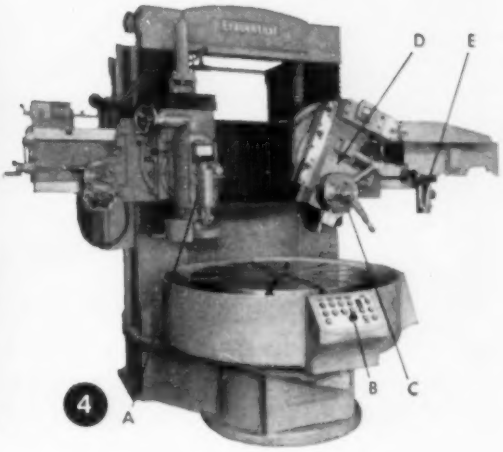
MANCHESTER • CONNECTICUT


One set-up...
1

...and you can turn, bore and finish grind a single workpiece to close tolerances on the NEW FRAUENTHAL SERIES 3100 TURNING AND GRINDING MACHINE.

With it, you obtain unusual machining accuracies that assure concentricity of related surfaces.





WITH the new Frauenthal Series 3100 precision turning and grinding machine you get accuracies previously considered impractical.

Designed to meet the most exacting requirements of jet engine manufacture as well as other precision applications, the Series 3100 machine is new from the ground up. Its unique design presents a host of opportunities to put large and extremely close-tolerance jobs on a mass production basis. And the 3100 offers exceptional capacity for precision turning and precision grinding.

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- Ultra-precision work table bearings
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. . . and this optional equipment

- Hydraulic tracer control
- Electronic table surface speed control
- Hydraulic wheel dressers for varied applications

Frauenthal Division

THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN

...about the pictures

PHOTO 1 shows how the operator uses a Series 3100 machine to finish bore the inside diameters preparatory to grinding operations.

PHOTO 2 shows the machine's contouring attachments being used to face the top surfaces of a workpiece.

PHOTO 3 shows how the machine performs close-tolerance finish grinding of the workpiece's top surfaces and inside diameter, to assure concentricity and squareness of related surfaces.

PHOTO 4 illustrates (a) grinding spindle with graduate swivel mounting, (b) push-button control panel, (c) five-station tool turret, (d) hydraulic actuated turning slide, (e) hydraulic tracer control (optional).

May we help you?

If you'd like further information on how the Series 3100 precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.

The Tool Engineer

Our Western Industrial Exposition

Next month we are holding our first Western Industrial Exposition in Los Angeles in conjunction with our Annual Meeting and Convention. The Show is already an assured success, not only because of the number and quality of exhibitors, but also because of the enthusiasm of members who are planning to attend. Over seventeen of our Western Chapters are actively participating in the technical sessions and conferences.

The enthusiasm of our West Coast members in the activities of our Society is a joy to behold, and it is in keeping with the industrial growth in this area. Tool engineering is most vital to this growth, and the Western Industrial Exposition at the Shrine Auditorium will exhibit the latest developments in tooling for the modern production shop.

More than two hundred seventy-five firms will be represented at the Show. I hope we will see you there.

Joseph P. Crosby

PRESIDENT
1954-1955

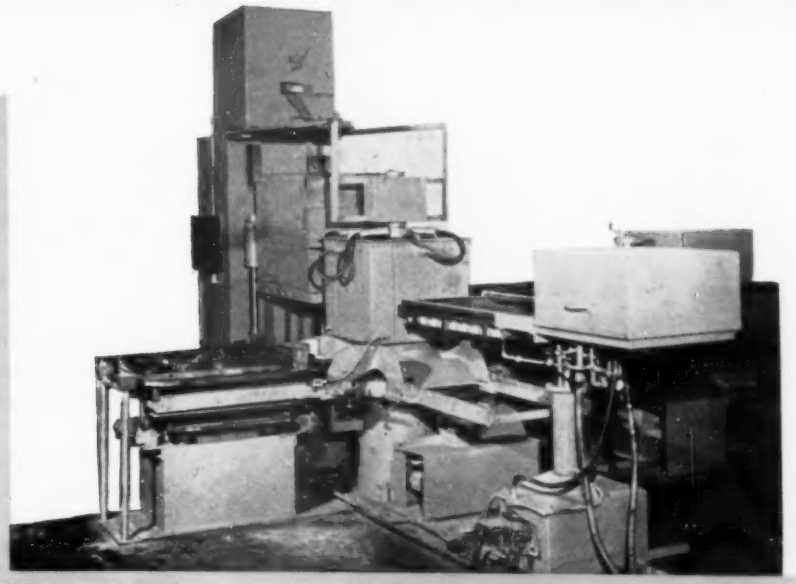


Fig. 1. Four-station four-pattern fully automatic shell mold making machine typifies the progress made in such equipment.

shell molding

the process and its possibilities

By Otto W. Winter*

Manager, Shell Mold Div.
Beardsley & Piper
Div. Pettibone Mulliken Corp.
Chicago, Ill.

WITH THE ADVENT of shell mold casting, the function of tool engineering moved into the foundry. Tool engineering is rapidly advancing the art of shell mold casting because the process lends itself so well to automatic operations. Tool engineers also gain from the process because one more proved production method is available. Although it was approached as a panacea and oversold in the beginning, shell molding has much to offer.

As with all manufacturing processes, shell mold casting will be specified by design and tool engineers to yield a better product at a lower cost. Shell molding equipment, *Fig.* 1, and its control is much improved over the crude "machines" first used. Skill is being removed from the operator and transferred to mechanisms.

To get the most from shell molding, the process and its capabilities must be understood. The process will be viewed through the eyes of a tool engineer and this article will show the benefits that can result from correct shell mold casting.

Shell molding's resemblance to standard foundry practice is primarily confined to the fact that molten metal is used. In this respect, it resembles die casting, investment casting and certain forms of permanent molding. It offers processing lines a link similar to that provided by induction heat treating. The process can be used to feed a production line or can be a separate entity. Individual castings weighing up to 200 lb are being poured but the shell mold casting field currently appears to be for parts weighing 50 lb or less.

Properties of Castings

Shell mold castings are accurate to close tolerances, *Fig.* 2, often as low as 0.002 to 0.005 inch per inch. Accuracy can depend on whether measurements are made across the parting line or not, although some parts have been made where accuracy across the parting line was as good as elsewhere. Generally, casting tolerances are increased

*Life member ASTE Buffalo chapter.

to 0.010 to 0.015 inch when dimensions cross the parting line.

As a result of close tolerances and accurate reproducibility, machining can often be avoided, *Fig.* 3. When machining is required, it is usually such finishing operations as grinding, reaming, etc. The amount of stock left for machining varies with the job. Larger castings usually require larger machining allowances. Allowances for exterior surfaces

—Photo courtesy Shell Cast Alloys, Ltd.

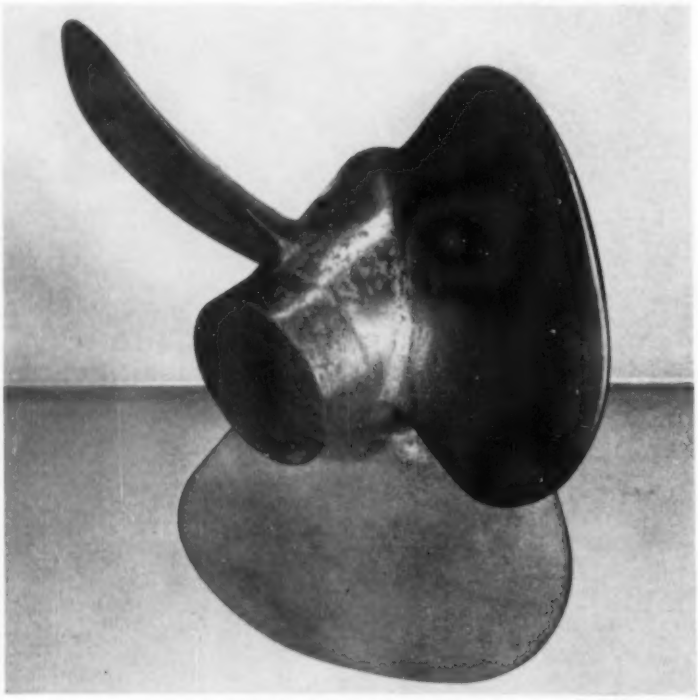


Fig. 2. Marine propeller shell cast in Alcan 350-W. Inch per inch tolerances held are: + 0.000 and —0.005 on blade working faces, + 0.000 and —0.015 on reverse faces, ± 10 minutes of arc on pitch ang'es and ± 10 minutes of arc on rake angles. Machining time is reduced 90 percent and over-all cost reduction is 50 percent over previous methods.

nominally run from 0.010 to 0.020 inch per side. Shell cast holes, ready for reaming or precision boring ,would have from 0.003 to 0.010-inch allowances depending on the size of the hole.

Large potential savings exist because machining stock can be minimized. With the shallow depths of cut required to finish shell moldings, heat generation is less, and feeds and speeds can be greatly increased. This leads to long tool life. Additional savings are realized because developed pressures and required horsepower are less. Lighter and less expensive machine tools and tooling can be used.

Shell molds contain little moisture and the surfaces of castings are not chilled. Hard skins are not even formed on iron castings. If a hard skin did exist, an excess machining allowance would be required so the tool could bite into base meta!.

Tapping and threading can be done on as-cast surfaces without damage to the crest of the thread on the cutting tool. As-cast holes can be directly reamed or broached, *Fig.* 4.

Coupled with general accuracy in shell moldings is high fidelity of surface detail. Both external and internal threads are being cast to size, *Fig.* 5. Cast threads are currently limited to Class 1 tolerances and to pipe threads that do not have to hold high pressure. Parting line fins can cause trouble in threads but methods are in use that minimize this trouble.

Teeth for slow speed gears, *Fig.* 6, are being cast to size and more accurate gears are cast rough with only finishing operations required. Sprocket and ratchet teeth, *Fig.* 7, are shell cast to size. Holes are cast to size within as close tolerances as could be achieved by average drilling. Sharp internal and external corners can be maintained when shrinkage is not a factor, and lettering and decorative designs come out clean and clear on cast surfaces.

Close duplication is important when castings must be located in jigs, fixtures and chucks for subsequent operations. A shell casting can be located from almost any point with consistent accuracy. Usually, no special locating spots are required. Target fixtures for casting inspection can often be discarded because once a mold pattern is broken in and has proper gating and shrinkage allowances, little change occurs. Duplication will be close until the pattern wears as a result of the abrasive action of stripping the mold from it. Shell castings can be made with little, and in some cases, no draft, which can reduce the amount of finish machining required but may speed wear of the pattern.

Castings of thin or varying section may warp more during cooling than average castings and may thus require greater machining allowances. With shell molding, such warpage is minimized, and thin, *Fig.* 8,, and variable sections can be successfully cast. Absence of moisture and the collapsibility, porosity and insulating effect of the shell mold combine to make possible casting of thin sections alone or in combination with thick sections where shrinkage will not prevent it.

Because chilling is avoided and because the mold has an insulating effect, uniform metal structure is achieved in shell mold castings. Gas inclusions cannot form because of the permeability of the mold. Tests have indicated that shell cast metal has good ductility, important when considering replacing forgings. With properly controlled melting and pouring, and because of the close duplication of shell molds, a high degree of uniformity is maintained from casting to casting. The rate of cooling of a casting in a shell mold can be controlled to some extent by the use of various mold backup media, such as gravel, sand, shot or contour metal plates.

face finishes of 100 to 120 microinches, rms, or better, *Fig.* 9, are common with shell mold castings. Sand or shot blasting is usually not required. Occasionally an extremely fine blast is used to clean a cast surface prior to painting. Usual cleaning is limited to an air blast or wire brushing.

Since shell castings are cast close to size and because castings can be redesigned, *Fig.* 10, for the thinner-sections made possible by the process, shell castings weigh less than other sand castings. Weight reductions of from 10 to 20 percent are frequent and greater reductions are recorded.

Gating in shell molds need not be large because metal flows freely due to smooth surfaces and permeability. In fact, gates, runners and sprues have to be choked off to pressurize the gating system and reduce metal velocity during pouring. This increases the yield and ratios of 80 percent of useable casting weight to total metal poured are common. Because of this, economies result in amounts of metal melted and melting capacity required.

Once gating is established, and melting and pouring practices controlled, defect-free castings can be uniformly produced as with other carefully controlled casting methods. Scrap percentages of as low as $\frac{1}{10}$ of one percent are currently secured and $\frac{1}{2}$ of one percent rates are common in highly repetitive high-production operations. This compares favorably with the best percentages obtained by non-casting, quality production techniques.

Shell molding is successfully competing with and supplementing other processes such as die casting, *Fig.* 11, investment casting, permanent mold casting, welding and forging. While shell molding will not produce the precision or intricate detail of die casting, it does approach it. Shell mold patterns are usually cheaper and longer lived than die casting dies. Hence, the tooling cost for moderate production favors shell molding. Die casting is substantially limited to zinc and aluminum alloys but shell casting can be done with almost any metal.

Shell castings will not achieve but do approach the precision and intricacy of parts cast by the various investment processes and in this respect lie somewhere between investment and dry sand castings. The biggest advantage of shell molding over these processes is in mold cost. Due to the ease with which molding can be mechanized and the speed at which molds can be produced, labor cost is minimized.

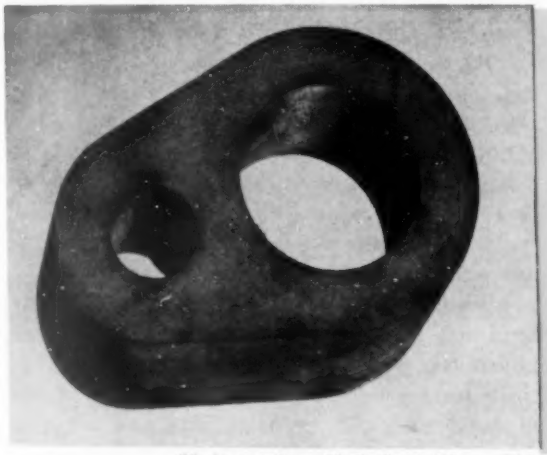
Shell molding has been selected over welded fabrication in many cases, *Fig.* 12, because of lower labor cost and elimination of various machining operations, such as drilling, that would be necessary in a weldment.

Shell molding permits production of intricate shapes, *Fig.* 13, that would be difficult or impossible to forge. Also, a shell casting often can be produced closer to final size than a forging and much machining can be avoided. Shell molding produces better surface detail than forging. Shell patterns are not subject to the wear and wash of forging dies and produce a more uniform product over a longer time. The fin on a shell casting is usually considerably less than the flash on a forging. Over-all tooling costs for shell molding are usually less than those for forging.

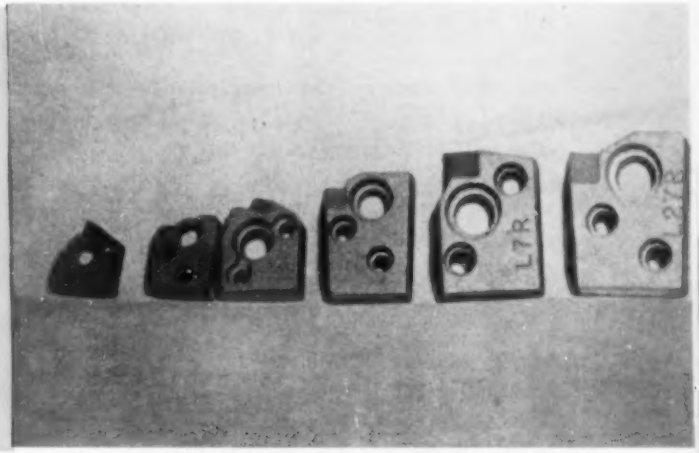
Metallurgical properties obtained in a shell casting provide a cast structure with outstanding homogenity.

Fig. 3. (below) Servomotor body shell cast in pressure-resistant alloy gray iron to dimensional tolerances of ± 0.002 inch per inch. Shell casting eliminates wasted time and material that were formerly caused by microporosity in the bores. Machining costs are reduced 60 percent over regular sand casting.

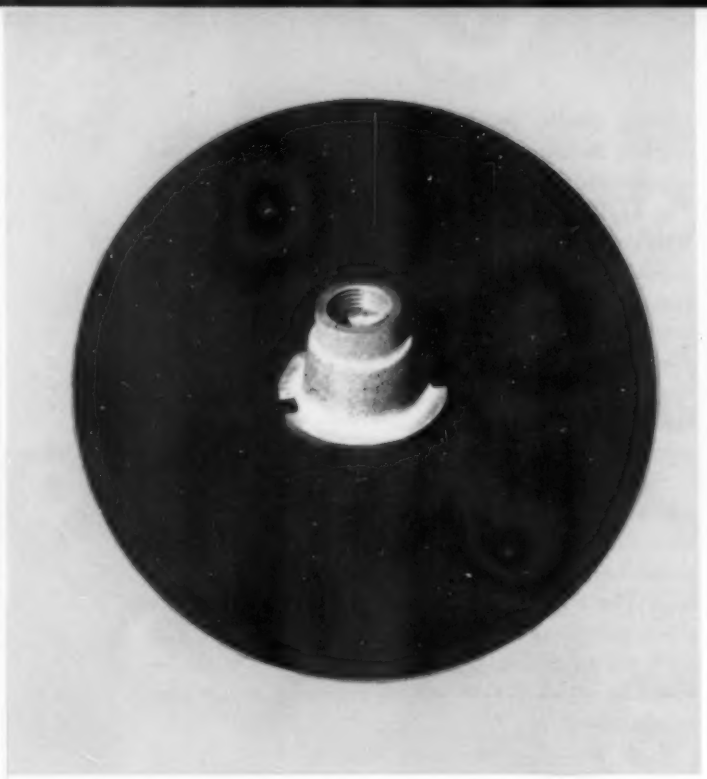
Fig. 4. (right) Chip breakers for carbide tools, shell cast in high-carbon steel. Formerly machined from bar stock, the cast breakers require no machining except reaming of the as-cast holes. Reaming is done without a jig.

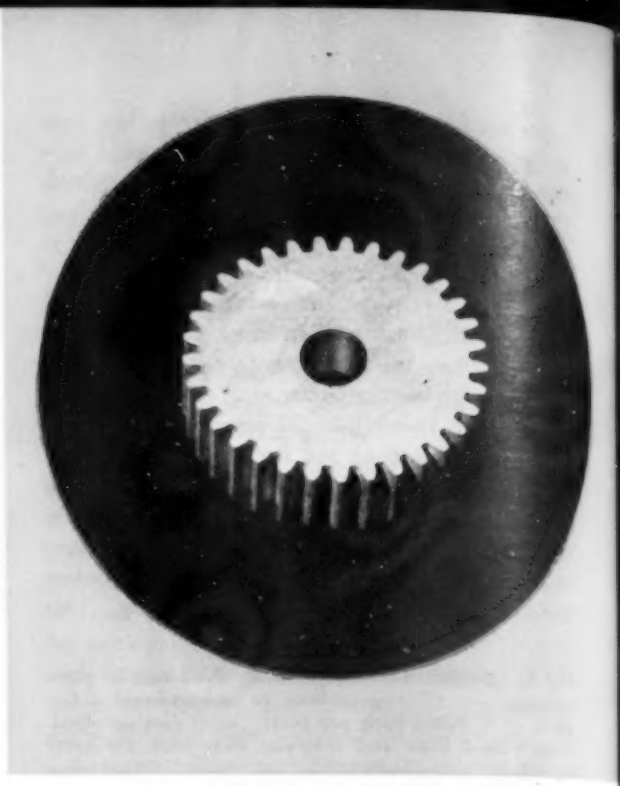


—Photo courtesy Shell Cast Alloys, Ltd.



—Photo courtesy Pelton Steel Casting Co.





—Photos courtesy Star Aluminum & Brass Co.

Fig. 5. (above) Threads can be shell cast with little difficulty. This part includes both cast 1 inch by 12 internal threads and a hexagonal hole cast to size.

Fig. 6. (right) Gear teeth can be cast to size, or an allowance can be made for finish machining. This gear is cast to size with 0.006 inch of stock left in the hole for reaming.

and shell castings can frequently be considered instead of forgings. The labor cost of shell molding is usually lower than that for forging.

While permanent molding is usually a highly mechanized operation, the cost and depreciation of permanent molds is sometimes high. This is accentuated if an attempt is made to permanent mold surface detail intricacy and sharpness comparable to that obtained with shell molding. Shell mold linings for permanent molds are practical and offer a means of effectively reducing permanent mold depreciation and replacement costs. The savings so effected are considerably greater than the cost of the shells.

Process and Procedures

Inversion investment and blowing methods are used to produce shell molds. Inversion investment consists of dropping a mixture of thermosetting phenol-formaldehyde resin and clay-free (or low clay) silica sand on a hot (400-500 F) metal pattern to form one half of a casting cavity. Sufficient mix is dropped to pile from 4 to 6 inches higher than the highest point on the pattern. During the 10 to 15-second investment period, the heat of the pattern melts the resin in a layer adjacent to the hot pattern surface. Thickness of the melted layer depends on pattern temperature and investment time.

At the end of the investment period, the excess sand-resin mix is removed and the remaining layer is cured for 30 to 40 seconds in an oven. During oven cure, polymerization of the resin is completed and the resin sets up hard. Molds are removed from the pattern by stripping pins. Removal is facilitated by silicone stripping solutions or waxes.

Shell blowing differs in that investment is accomplished by blowing the mix into a cavity between two patterns, one forming the mold face and the other forming the back. Curing and stripping are performed as with inversion investment.

After the cured shells are stripped from the pattern, they are ready for pouring or can be stored indefinitely because they do not deteriorate. Two shells form a mold. There are three basic methods of mold make-up. Separate cope and drag patterns may be used or the pattern may contain cope on one side of center and drag on the other. With such an arrangement, a shell may be broken in half (waffled) by a breaker strip on the pattern or two shells may be booked face to face.

Mold shells are held together in a number of ways during pouring. The simplest, where horizontal gating is used, is to set the drag on a plate or in a pan of dry sand; set the cope on top and place some flat weights, sand or both on the cope. If vertical gating is used, a simple clamping arrangement between two plates suffices. The shells can be glued together and set in racks or frames for pouring. Gluing can be done either with liquid adhesives or powdered resin. After application of

the adhesive, the shells are pressed together to establish the bond.

Adhesive assembly, however, is only as strong as the adhesive used. Clamp plates or weights will do everything gluing will do, and more, without the extra cost of the gluing operation, material and equipment. Where molds are to be stored, gluing will help keep out dirt and minimize handling damage. Care must be exercised, however, to avoid spreading the parting line.

Gluing is sufficient when a backup material, such as shot, sand or gravel is used. Shell halves are set in a metal box or can and the the backup material is poured around them. It is essential to keep the shells together during this operation and necessary to shake or vibrate the box to assure solid and uniform packing of the backup material. Uniform distribution of backup material poses one of the greatest problems in its use. In addition, handling and cooling of backup material for re-use, requires considerable equipment or involves high labor cost. Wherever possible, the shells should simply be clamped together or weighted down. Castings as heavy as 75 lb in grey iron are reportedly being poured successfully by merely clamping the shells together.

Mold assembly can be facilitated by providing a series of flattened cones on the pattern. These cones may be the same height from the pattern plate as the pattern or may vary. Cones and pattern protuberances provide a series of clamp points to assure uniform clamping pressure and mold closure. To provide accuracy, cones are pressed to size between investment and curing operations while the back of the shell is still soft.

This operation can be done automatically on certain shell mold making machines. Methods of pressing and clamping are shown in *Fig.* 14. Such a procedure also permits an unskilled machine operator to prepare molds for pouring. If a separate mold backup material were used, an extra operation and operator would be involved.

Blown shells, because of accurate control of the back surface, can be provided with positive support over the entire mold or any part of it. In this manner, the shell itself functions as if it were a liner for a permanent mold. Such liners and contour-plate backed molds can be made thinner and with lower resin content than inversion invested shells. A nominal thickness of $\frac{1}{8}$ inch is adequate in some instances.

There is a difference between the "take-out" and "shake-out" periods after pouring and solidification. Mold remnants and castings can be removed from the pouring fixture plate or box before they are sufficiently cool for shake-out. After take-out, heat of the casting further decomposes the shell by burning out the resin so that ultimate shake-out is greatly simplified or reduced to a vibration screen, air blast or wire brush operation. Casting cleaning and snagging are reduced to a minimum. Gating is often broken off, instead of cut or sawn, without damage to the casting because of its small cross section.

Costs of mechanization or automation in shell molding are lower than for any other foundry process with the possible exception of permanent molding, which process involves high mold tooling costs. Handling of lightweight shells is a simple matter and can be done with light equipment. This is especially true when molds are used without backup material. The amount of sand used in shell molds is about 5 percent of that used in other sand molding methods.

Molds are automatically stripped from the pattern and delivered to the operator ready to be prepared for pouring. When shells are automatically delivered to the pouring preparation station, automatic pattern cleaning and coating are usually provided. A simple gravity roller conveyor from mold

—Photos courtesy Emmaus Foundry and Machine Co., Inc.

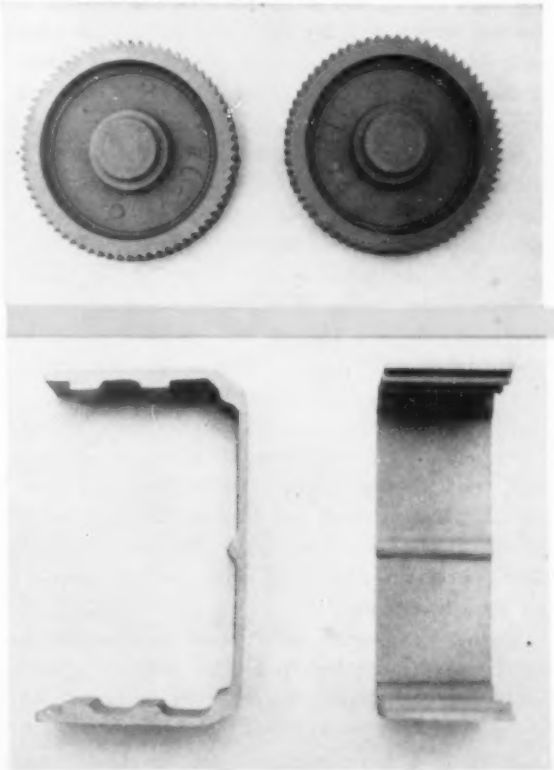


Fig. 7. (top) Ratchet with 68 teeth is shell cast and has better wearing qualities than the completely machined unit it replaces. Saving in weight on the 3¾-inch diameter ratchet is 30 percent. About $4.80 machining cost is saved per unit.

Fig. 8. (bottom) Aluminum electronic device with 0.080-inch wall could not be produced by regular sand casting. Shell cast unit replaces die casting with saving of 75 percent, with better ductility and adequate surface finish.

—*Photo courtesy Metal and Alloy Specialties Co., Inc.*

Fig. 9. (above) Aircraft part is ready for use after casting except for drilling holes in bosses. Finish on the part is 60 microinches, rms.

—*Photo courtesy Shell Cast Alloys, Ltd.*

Fig. 10. (right) Fractional horsepower motor endshield shell cast of gray iron with tolerances of ± 0.002 inch per inch. Elimination of rough machining and buffing reduced costs by 60 percent on finished piece. Because shield was redesigned for shell casting, weight was reduced 30 percent.

assembly to pouring station is sufficient and flexible. Power-operated continuous conveyors can also be used.

After metal is poured, molds continue around the conveyor while cooling. By removing molds as quickly as possible, the number of pouring fixtures needed is minimized. While castings are not cool enough to withstand immediate shake-out after take-out, the mold has burned out enough so it no longer possesses any strength to control the casting shape. The shake-out screen automatically separates castings from mold and backup material. Castings, gating and large mold chunks remain on the top screen and are delivered to the discharge end. Mold backup material is caught on an intermediate screen and discharged onto a return conveyor to cooling or storage facilities.

Where dry sand is used as a backup or bedding material during pouring, fine mold remnants can be thrown in with it. All the take-out and shake-out operations can be done automatically although one operator at the take-out station may be of value.

None of the shell mold or core making operations involve much skill and all can be easily done by female labor. The same is true of mold assembly operations. The shell mold operator can usually handle the assembling of the molds provided machine operation is automatic. If machine output is high, as with multipattern automatics, and there are many cores to set some assistance may be required. If shell cores are used, the shell core machine operator and the shell mold machine operator can work as a team.

Pouring shell molds involves no more skill than a green sand mold but should be done by a man. The technique is slightly different but easily learned. Take-out and shake-out operations involve no skill. Take-out is a hot strenuous job. Shake-out and subsequent cleaning can be done by women, however.

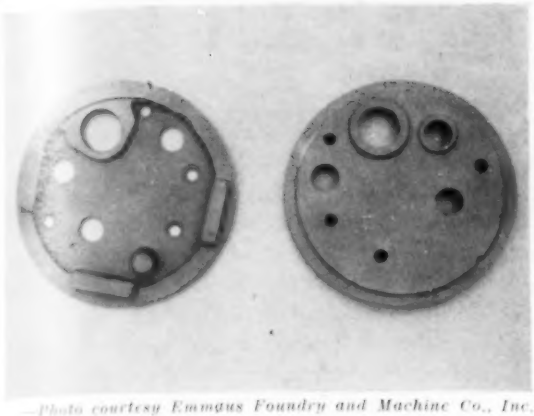
Prime requirements in shell molding, once patterns are broken in and gating is established, is consistent control of volume, time and temperature. Good shell mold making machines provide such control automatically. Mixing of sand and resin, or the coating of sand with liquid resin can be automatically controlled. Some sand coating machines operate on a completely automatic cycle and no skill is involved.

Floor space requirements for shell molding are comparable to those for permanent molding. In about 1200 sq ft, production of 4 molds per minute, including pouring, shake-out, sand-resin mixing or coating, etc., can be carried out. Space required for metal melting varies with the type and size of equipment and the metal being melted. There have been instances when added floor space was needed for green sand molding to meet increased production that indicated an excess of existing floor space when shell molding was considered. A typical molding loop arrangement is shown in *Fig.* 15 for continuous pouring.

Preparation of shell mold sand is either a simple matter of dry mixing or a resin coating process. The coating process is preferred because it avoids dust and segregation problems. Many shell mold making machines operate with dust-tight sealed systems and will handle coated or dry-mixed sand without dust or separation.

Main advantage of the sand coating process is that it requires only about half as much resin to produce the same cold mold tensile strength as with dry mixes. Thus resin cost is practically cut in half.

All the sand used in a shell mold is usually lost and no effort is made to reclaim it. This is not



—Photo courtesy Emmaus Foundry and Machine Co., Inc.

Fig. 11. Aluminum electronic device shell cast with 40-percent saving in machining time. Mounting holes are sufficiently accurate to require no machining. Surface finish is equal to die casting and shell cast part has higher tensile strength.

necessary, however, because the sand surrounding the casting usually has the resin completely burned out and can be re-used. Also, resin can be burned from mold remnants by heating to about 1500F. Where sand cost is high, reclamation may prove feasible.

The amount of sand used in a shell is about equal to that lost in the green sand molding process. Because they are usually clay free, shell sands are more expensive than green sand but the cost difference per mold is slight. Washed and dried synthetic sands currently common in green sand molding further narrows the cost differential. Synthetic sand binders used in green sand practice tend to offset resin costs. Resin coated shell sands can be stored indefinitely without losing their properties as long as they are kept dry.

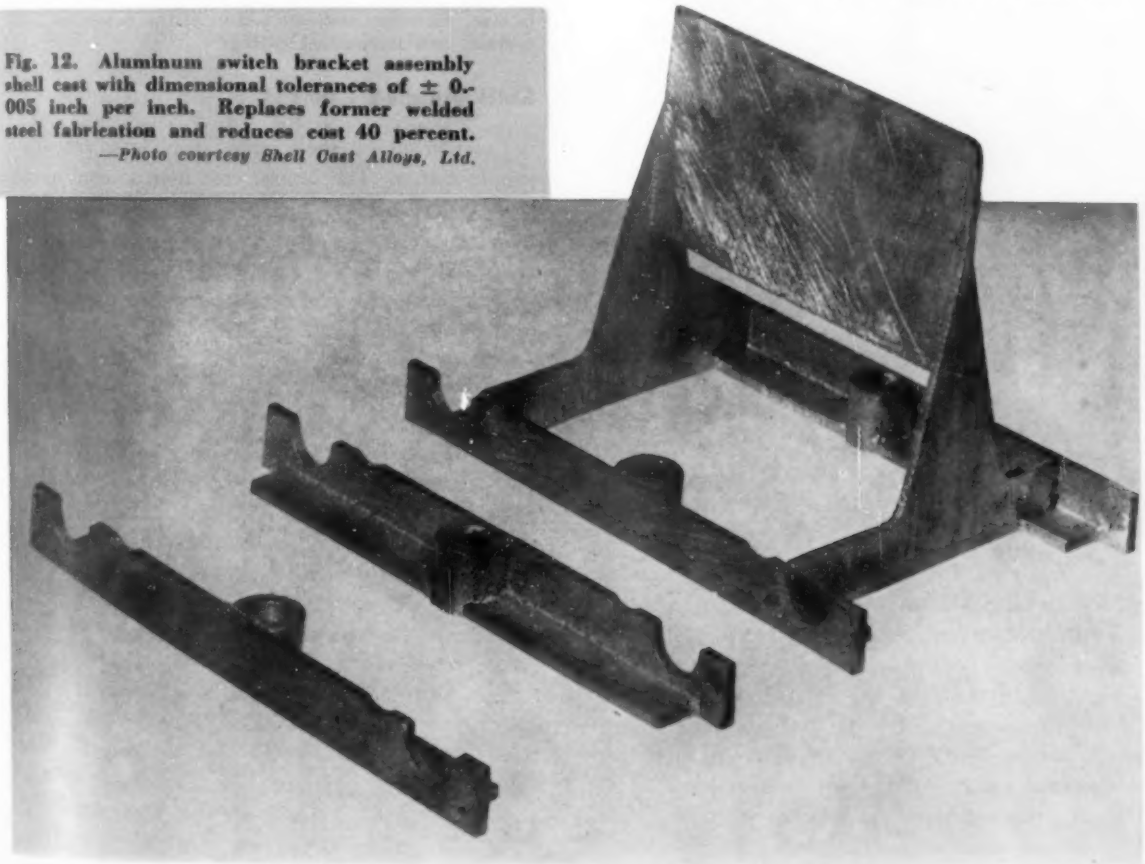
Shell molding permits the casting of holes and recesses to close tolerances and with high fidelity that would otherwise require separate cores. Such cases are naturally limited to those surfaces that will draw from the pattern.

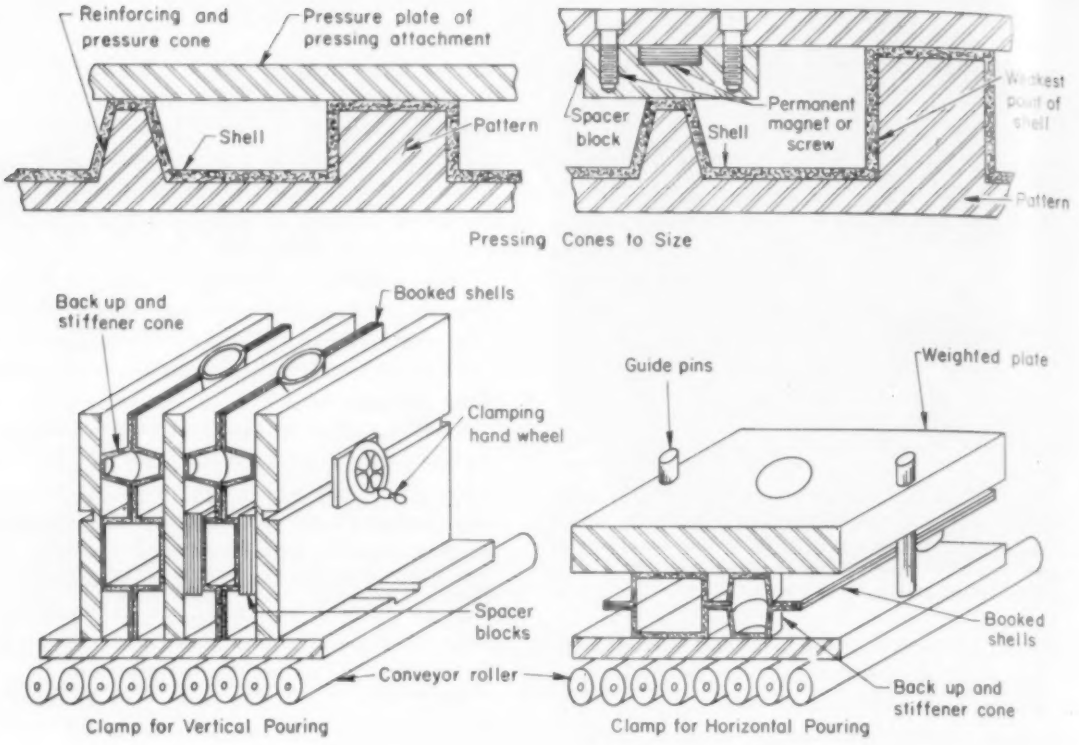
Shell cores can be blown at extremely high production rates. Automatic machines can blow 4 to 6 times per minute with single or multicavity heated core boxes. Cores can also be hand dumped for small production requirements. A shell core comes out of the core box ready for insertion in the mold, *Fig.* 16. There is no further baking required. This feature not only reduces cost but is advantageous when preparing an automatic operation.

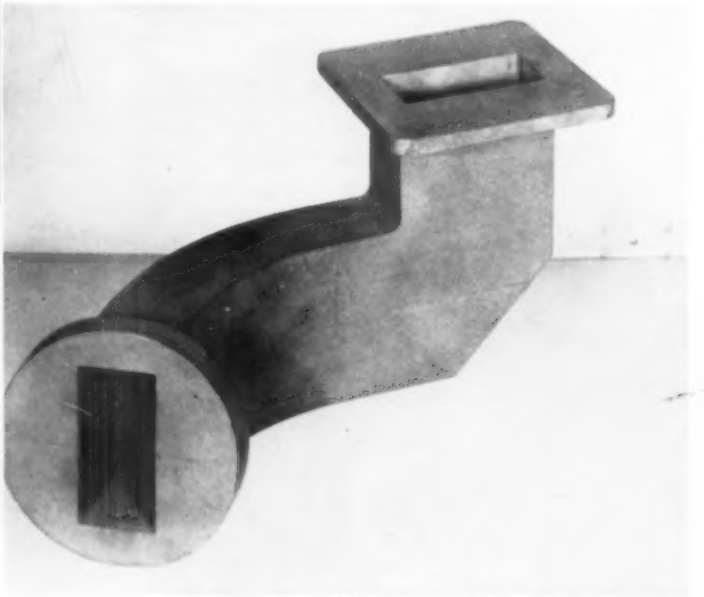
Shell cores offer the same general advantages as shell molds. They can, because of their accuracy, be precisely set in the mold. They can be used in shell molds, green sand molds or any other type of mold, including permanent. Shell cores result in large savings in core sand and binder because of their hollow construction. Shell cores have good permeability and controlled collapsibility.

Shell mold founding is basically a clean oper-

Fig. 12. Aluminum switch bracket assembly shell cast with dimensional tolerances of ± 0.-005 inch per inch. Replaces former welded steel fabrication and reduces cost 40 percent.
—Photo courtesy Shell Cast Alloys, Ltd.







—*Photo courtesy Shell Cast Alloys, Ltd.*

Fig. 13. (left) Wave guide shell cast in aluminum. Units replace former fabricated guides with cost reduction of 80 percent on the finished piece.

Fig. 14. (above) Method of pressing pressure cones to size. Sketches indicate action of the cones for both vertical and horizontal gating.

ation. Walls and equipment can be painted in pastel colors, and a light, bright and healthful work place is easily maintained. The slight amount of lightweight burned resin dust arising during shake-out can easily be handled by a hood. Shell molds, while being cured and while burning during and after pouring, give off ammonia-like fumes that are noxious but nontoxic. Hoods over curing and pouring areas take care of any smoke or fumes, or a high ceiling is sufficient.

Shell Molding Costs

Calculation of shell mold costs is a relatively simple matter. The largest cost item in shell molding is the resin binder. Resins are now in the 28-cents-per-lb range, which represents a 20-percent reduction from 1951 prices. The most significant cost reduction, however, is obtained by use of resin coated sand. Cold tensile strengths of 400-600 psi are being developed with 2½ to 3½-percent resin to sand. To achieve equal strength with a dry sand-resin mix would require about double the resin.

On the basis of 3-percent resin at 28 cents per lb, the resin cost per pound of shell would be $.0084. A shell measuring 24 x 30 x 3/16 inches would weigh about 7.8 lb (based on fine shell mold sand at 100 lb per cu ft). On this basis, the resin cost per mold would be $0.065. When comparing costs with other methods, it is important to determine cost of binder per mold.

Shell molding requires dry, zero or low-clay silica sand preferably with a round grain. In AFS finenesses of 100 to 120, these sands vary in price from $3 to $10 per ton. Green mold sand ranges in price from $2 to $3.50 per ton. Core sands cost from $2.15 to $3.50 per ton. On the basis of the

maximum listed prices, shell mold sand would cost about ¼ cent per lb of shell more than green sand. If an 8-lb shell were used, additional sand cost would be about 2 cents. If half the sand were reused, the added cost per shell would be 1 cent.

Cost of the release agent used to facilitate stripping the shell from the pattern is slight. One type of silicone emulsion, for example, costs about 72 cents per gallon. On the basis of spraying the pattern at every tenth cycle, one gallon of release agent would produce over a thousand shells. An increasing number of resins, particularly the sand coating types, carry a release agent in them so that an additional release agent would be required only occasionally on difficult draws.

Generally, more castings can be crowded into a shell mold than in a green sand mold of equal size. This is possible because the greater wall strength of the shell permits closer spacing. Since more castings can be made per mold, the mold cost per casting is reduced.

Labor cost in shell mold making with proper equipment is a minimum. Women can easily handle most of the jobs and no particular skill is required. A typical work force would include: one girl mixing or resin coating sand, one girl making and assembling molds, one girl making and setting cores, two men pouring, one man (or girl) for take-out and shake-out, and one girl to break or cut gates and clean. Such a group can produce from 3 to 4 molds per minute. On the basis of $6 per hour for labor the labor cost per mold would be about 8 to 9 cents.

In addition to the lower cost inherent in shell molding, is the fact that a better product results. Good finish and appearance, high fidelity of detail, accuracy and sound metal structure are features that would normally command a high price. The large savings, possible in subsequent machining are in addition to the possible savings in the process.

Patterns and Tooling

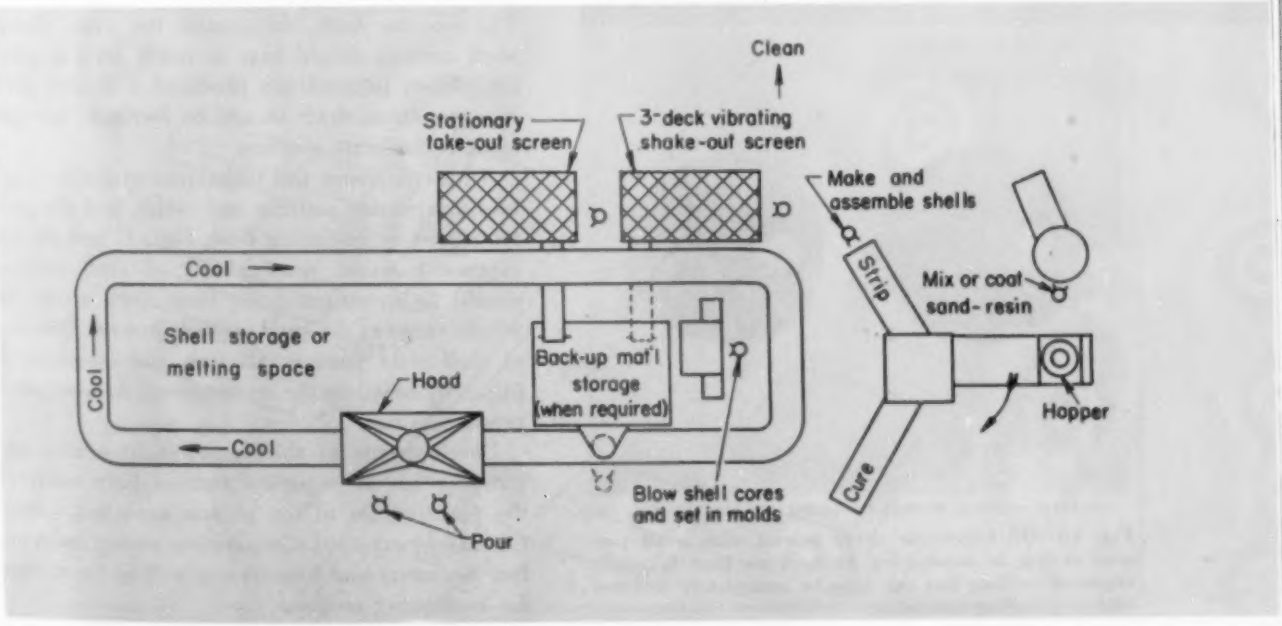
Pattern cost is one of the significant factors to be considered in shell molding. If the job warrants metal patterns, shell molding should be considered. Also, metal pattern amortization should be weighted by all the previously mentioned cost reductions and process advantages. Savings in tooling for subsequent operations in the machine shop can often offset shell pattern costs.

A popular misconception exists that shell mold patterns must be prohibitively expensive. This can be true if a precision machined and polished iron pattern is involved. Such patterns are desirable for high production jobs but are not needed or warranted for many lower quantity jobs.

For such work, precision pressure cast aluminum or copper alloy patterns are available. For example, a 24 x 30-inch aluminum pattern with accuracy of 0.010 to 0.012 inch per foot can be had for from $750 to $1200. A copper alloy pattern of the same size that will outwear the aluminum one about 12 to 1 and be accurate to about 0.015 to 0.020 inch per foot will cost about $1200 to $1500. Multiple cavity patterns can easily be made from a single wood or metal master pattern.

Gating can be cast integrally or mounted separately. Integrally cast gating is the least expensive. By making it oversize, gating can be adjusted during experimental and break-in pours. Gating can be successively reduced until brought to a minimum

Fig. 13. Typical layout of a shell mold foundry for continuous pouring.



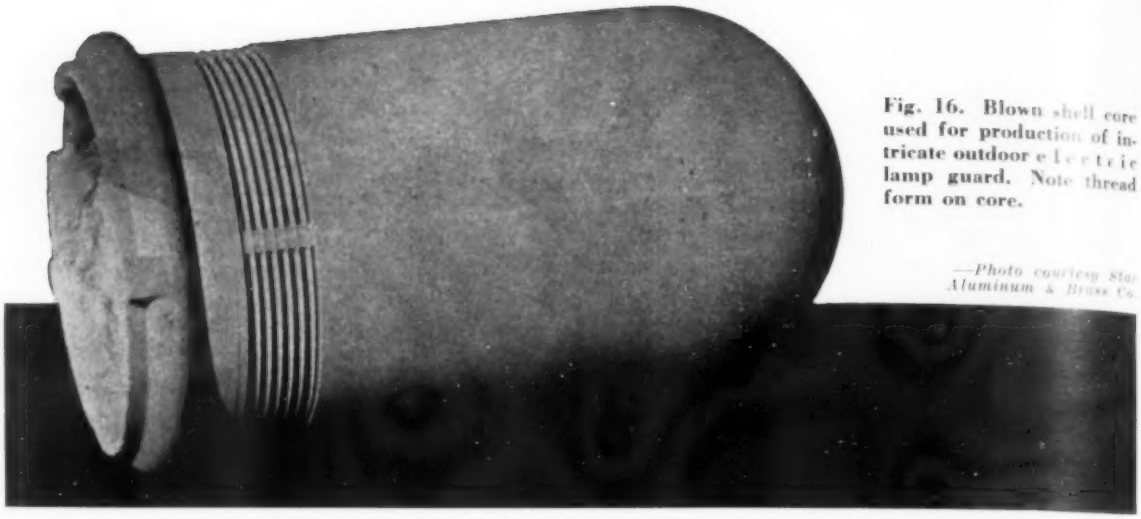
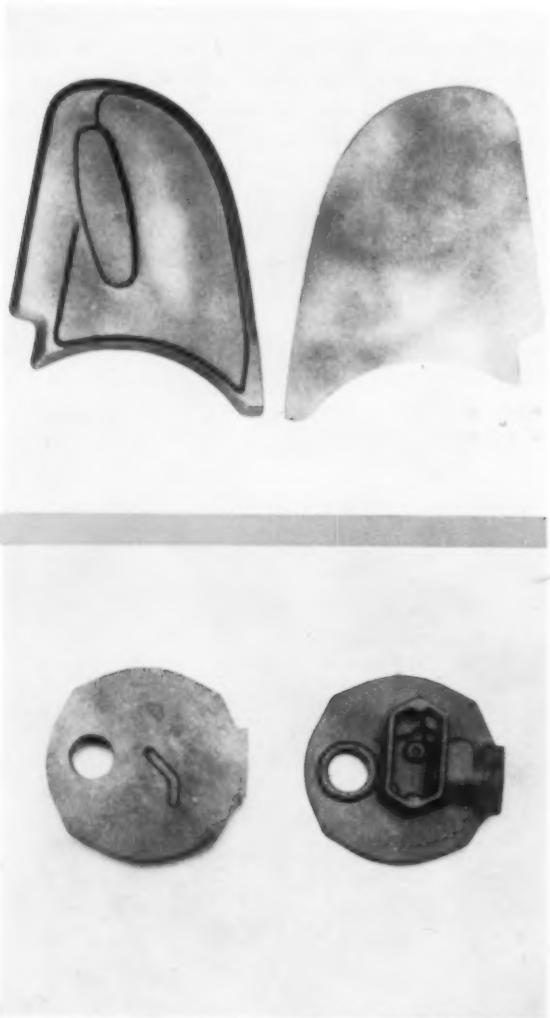


Fig. 16. Blown shell core used for production of intricate outdoor electric lamp guard. Note thread form on core.

—Photo courtesy Stur Aluminum & Brass Co.

Fig. 17. Plate for slicing machine is shell cast of iron with a 20 percent saving in weight. Surface finish is sufficiently good so all grinding can be avoided before final painting.



—Photos courtesy Emmaus Foundry and Machine Co., Inc.

Fig. 18. Oil lubricator cover is cast with a 70 percent saving in machining time. Iron part formerly required milling but can now be completely finished with a grinding operation.

with resultant maximum metal yield. If gating has to be increased, it can be cut out and new gating attached by screws from the back of the pattern. Gating can be attached from the front of the pattern by screws if the screw heads are covered with braze metal and smoothed. Integral gating is preferable when possible for reasons of heat transfer efficiency.

Since the surfaces that must be closely held on a shell casting, to avoid or reduce machining, are usually flat or surfaces of rotation, the pattern can be made oversize at those points and later cut down.

Pattern wear in alloy cast iron appears to be about 0.0001 inch per 100,000 shell ejections. Where a job would run long enough to wear out several sets of aluminum match plates, the alloy iron shell mold pattern is usually warranted. Copper alloy pattern materials appear to wear about three times faster, or 0.0003 inch per 100,000 shell ejections. Aluminum alloy patterns wear from 0.003 to 0.004 inch per 100,000 shells.

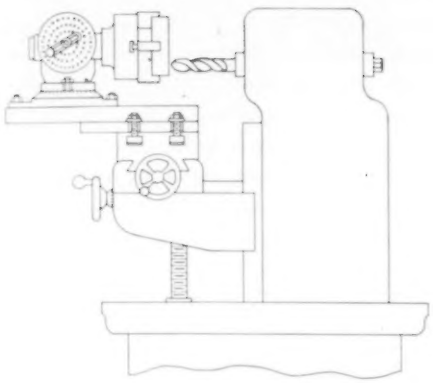
Pattern wear is primarily on vertical surfaces. The less the draft, the greater the wear. Hence, shell castings should have as much draft as possible. When patterns are produced with zero draft in some areas, draft should be increased in other areas to facilitate ejection.

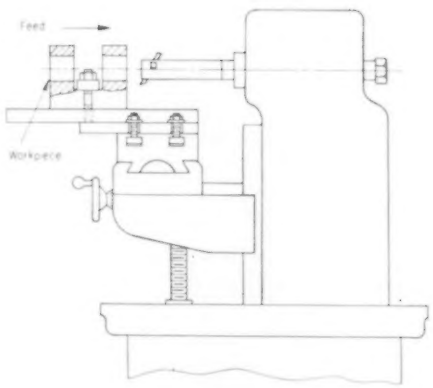
With equipment and techniques available to obtain inexpensive patterns and molds, and the great reductions in machining time, *Figs.* 17 and 18, and expense possible, practicability of shell molding should be investigated for those jobs within the weight range of the shell molding process. Selection of shell mold pattern materials and equipment is primarily based on the economics of the anticipated production run.

Developments in shell molding have been outstanding but as engineers become fully aware of the potentialities of the process even larger benefits may be expected. Cooperation among designers, tool engineers and foundrymen will be the keynote for continuing progress.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work





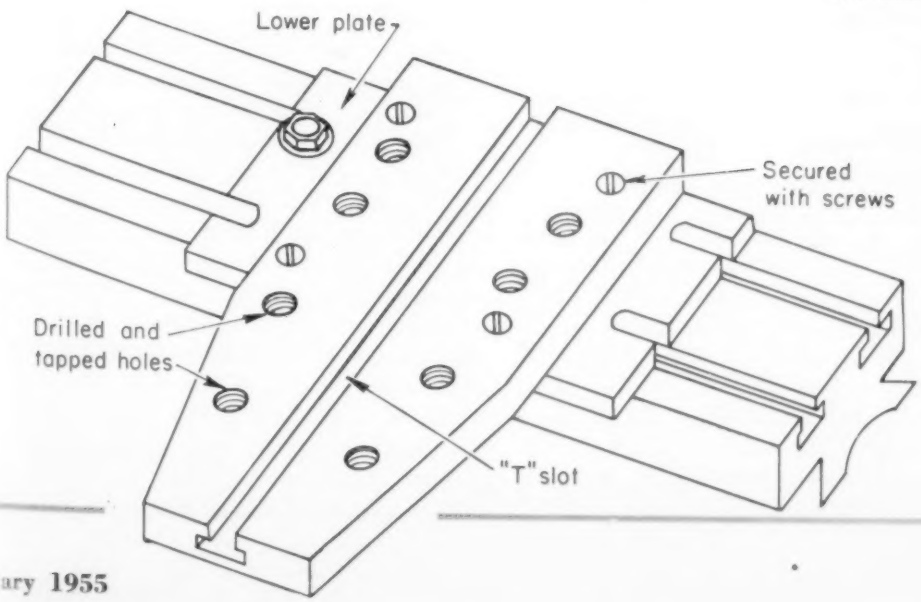
Auxiliary Boring Table

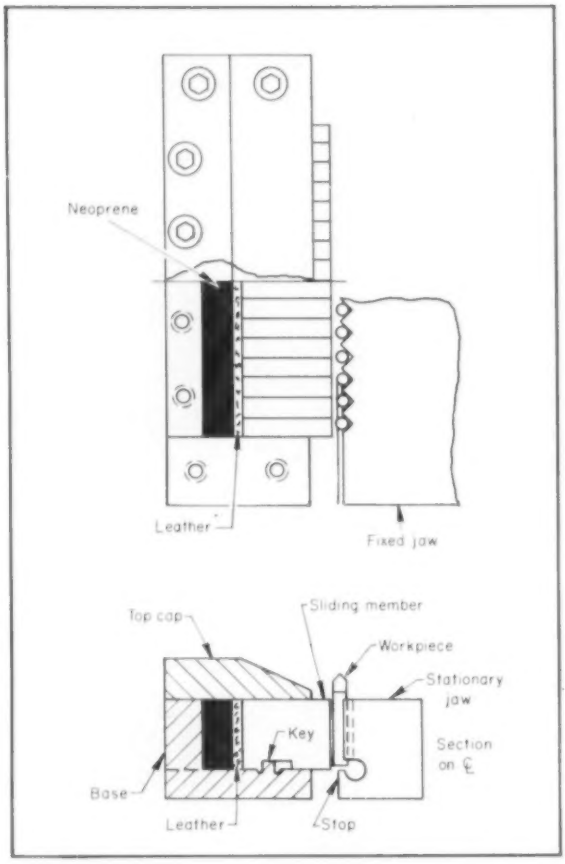
Effective capacity of a small milling machine may be extended by the use of the illustrated boring plate or table. This extension table will allow the mounting of jobs which would otherwise be impossible due to the restricted cross travel of the machine.

Rather than making a pattern and casting, two heavy steel plates are fastened together with recessed socket screws. They are then ground flat and parallel. The top plate has a T-slot accurately machined at right angles to the table travel for alignment of either a dividing head or miller vise. A series of drilled and tapped holes for mounting studs over the surface of the plate aids in securing larger work. The assembly is secured to the standard miller table with T-bolts and aligned with keys.

This added capacity has proved to be a lifesaver on many light jobs of large overall size. The illustrated typical boring operation on a casting and the drilling setup with a dividing head are two examples of possible usage.

H. J. Gerber
Member-at-Large
Stillwater, Okla.





Multiple Clamping Vise Jaws

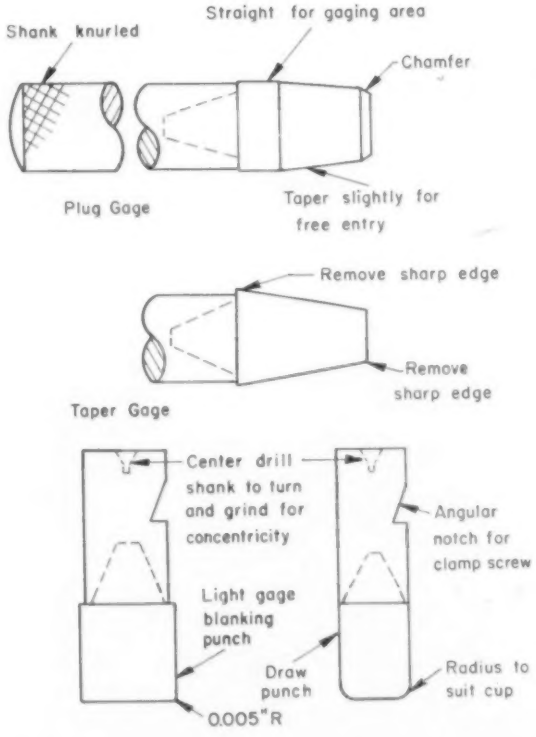
Equalizing jaws for holding multiple small parts during machining operations are frequently required and the simpler the setup, the better. The fixture shown takes advantage of hydraulic pressure in an unusual manner. A thick piece of neoprene is used as the medium.

The workpiece is a small cylinder on which the end is to be milled in the wedge shape depicted. The fixed jaw is made with vertical serrations to hold the parts. The horizontal stop on the jaw is relieved by means of a large hole to provide for easy cleaning, as shown in the sectional view.

The movable jaw consists of a base portion and top cap. A key on the base plate holds the sliding members in position. A piece of leather is inserted between the sliding members and the neoprene to prevent extruding it into the seams. Close fits are required to secure proper action. All parts are hardened and ground on working surfaces.

This clamping fixture requires little or no maintenance yet is effective for holding parts that vary a little in size.

L. H. Bobbitt
Toledo Chapter



Carbide Mandrel Salvage

Many tungsten carbide tube mandrels with brazed-on nibs are scrapped when worn or mutilated. With a little ingenuity a large proportion of these can be inexpensively converted for other toolroom or gage uses.

The simple conversions illustrated are a few examples of many possible adaptations for items such as plug and taper gages or blanking and draw punches. Grinding of the nib only will suffice for many of these applications. Additional machine work is necessary with the punches as shown and optional with the gages.

William V. Anderson
New Haven Chapter

Beading Device

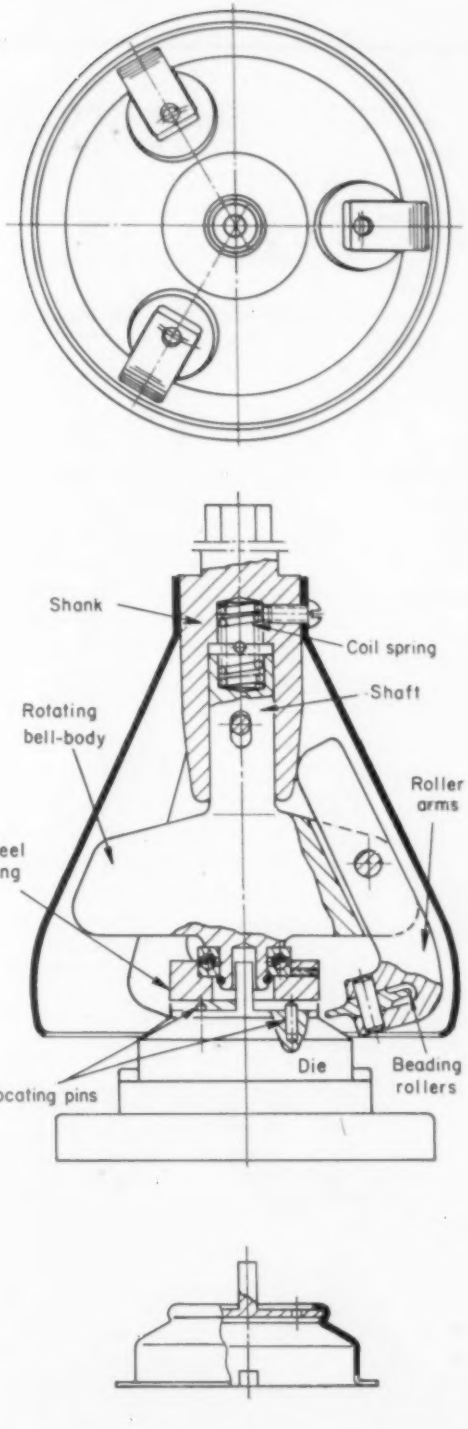
While there are many methods of assembling sheet metal cups to mating details, a beading operation seemed the most satisfactory for the parts shown in the accompanying sketch. An unusual feature of this operation is that it is performed in a drill press rather than conventional means such as lathe, turret lathe or punch press.

Setup of the beading device is as follows: The drawn sheet metal cup is placed on a die over two locating pins, which serve to prevent the cup from rotating. The mating part sits on top of the die, also. A clearance hole is provided for the shank of the detail part in the main bell-body. The shank of the beading device is fastened in the spindle of the drill press. Three sheet metal screws for which holes are provided in the shank hold a sheet metal cover in place. The shaft end of the beading mechanism is held inside the shank with a sliding fit, by means of an oblong hole and round pin. Three arms containing beading rollers are linked to the rotating bell-body by slots and pins.

In operation when the drill press spindle descends, the tapered part of the shank forces the upper part of roller arms outward, causing the beading rollers to be moved in against the work. A steel ring, containing a radial ball-bearing mount to fasten it to the bell-body, holds the piece parts in position. A coil spring in the shank of the beading device is compressed when the steel ring first comes in contact with the workpieces. The bell-body is permitted to slide up a short distance in the shank by the oblong hole in the shaft. When the beading operation is completed and the spindle moves upward, the coil spring forces the bell-body down to its stop.

The tool is shown in its lowest position. The arms holding the beading rollers are thrown out into open position by centrifugal force when the drill spindle moves up. This is a fast operating assembly tool which is used in mass production.

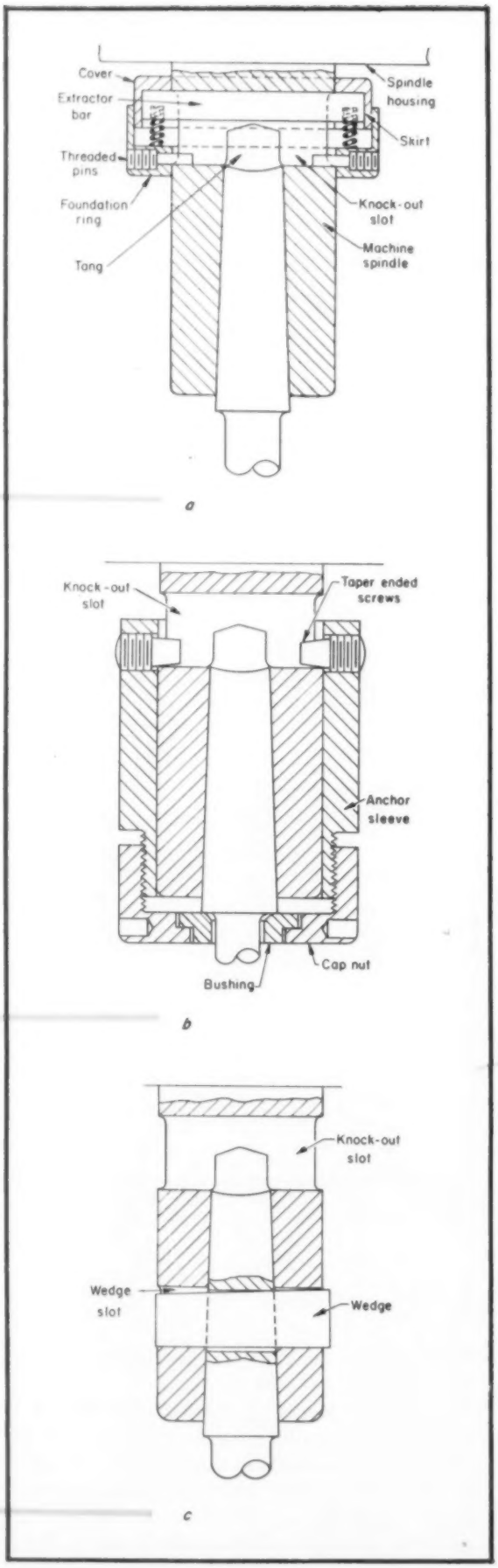
Hjalmar Dahl
Upplands Vasby, Sweden



Locking Devices for Taper Shank Tools

Removal of tools used in a drill press from conventional taper shank holders often results in chipped, dulled or otherwise damaged tools because both hands are used in driving a tool out, leaving it to fall to the machine table. The drive is also likely to become disengaged when heavy boring tools are used or if the work happens to require an upward feed, as when the underside of a flange is spotfaced. The devices illustrated were designed to overcome these difficulties.

Attachment at *a* can be permanently fitted to the drill spindle, permitting quick change of tools without use of tapered drifts and hammer. To release the tool, the operator merely traverses the spindle upward until the top surface of the extractor contacts the lower face of the spindle housing. The re-



sulting impact between the extractor bar and tool tang loosens the tool, which can be caught in the operator's free hand.

The device is relatively simple to make. A hardened steel extractor bar is fitted into the upper part of the knockout slot in the machine spindle. The depth of this bar is such that there is clearance between it and the top of the tool tang. This clearance is maintained during normal operation by means of a pair of compression springs held against a foundation ring.

The foundation ring is a snug fit on the outside diameter of the machine spindle and is held in position by a pair of threaded pins whose shanks engage the bottom surface of the knockout slot. A dished cover fits over the extractor bar, giving a large upper surface for making contact with the face of the spindle housing. The cover skirt telescopes within the foundation ring so that the entire devise presents a smooth and unbroken surface for operator safety.

The compression springs must be of proper weight so that a quick upward motion of the spindle will bring the tang sharply against the extractor bar when the device strikes the spindle housing. With this device it is possible for the operator to change tools almost as rapidly as with a quick-change chuck.

If it is inconvenient to dismantle the machine spindle for drilling and tapping of screw holes, the positive locking device shown at *b* can be adopted. The drill shank is held in place by a cap nut having an internal thread which engages with the threaded exterior of an anchoring sleeve. The sleeve is prevented from sliding and revolving on the exterior of the spindle by a pair of screws with tapered ends which engage the spindle knockout slot. The screws are the hexagon socket type and can be used for applying a final strong upward pull on sleeve and cap nut to tighten the taper shank firmly into position. The screw tapers are hardened.

By fitting a bushing into the cap nut, the positive locking device can be modified to suit various shank diameters by substituting suitable bushings in the cap nut recess. This device is particularly adapted to spindles having the slot for taking a locking wedge as shown at *c*. The wedge slot can be utilized as a seat for the taper ended screws, in which case, the sleeve can be short in length. It is advantageous to fit these locking devices to quick change chuck shanks as they allow operations with heavy tools or tools which exert a downward pull on the machine spindle. The locking devices will not interfere with rapid tool changing.

C. T. Bower
London, England

water hardening tool steels

. . . why many grades are needed for best performance

By George A. Roberts*

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Latrobe, Pa.

WATER HARDENING TOOL STEELS represent an important group of materials for the tool engineer. They can be used for almost every conceivable type of tool or die and are often considered the starting point for tool steel selection. Although production runs may be shorter than those secured with alloy tool steels for the same jobs, they represent the largest tonnage of tool steel used for many types of applications, *Fig.* 1. For certain tool applications they are indispensable.

Water hardening tool steels are actually plain carbon tool steels or carbon-vanadium tool steels with little or no alloying elements added. Because of long experience with these steels, industrial demand has created a number of specific modifications with varying toughness or hardenability. This has led to a great deal of confusion about specifications, availability and uses of such steels—confusion heightened in recent years by a classification system that permits the identification and coding of each individual modification.

In this JIC (Joint Industry Conference) system the symbol W is used to represent the over-all group. A second symbol represents a basic variation of analysis, such as the addition of vanadium or chromium, alone or together. A numeral system is employed as a further suffix to identify the carbon content of the steel, and a letter, to identify the approximate hardenability, is added. Finally a numbering system represents the various qualities that are available. Thus, for example, W2-10-R-1 identifies a carbon-vanadium tool steel (2), with 1.00-percent carbon (10), regular hardenability (R) of special quality (1).

When all of these factors are multiplied it is quickly apparent that over one hundred types of water hardening tool steel can be identified. Although true, nothing could be more misleading. Such emphasis leads to confusion of the problem at hand, instead of rationalization. What is needed, of course, is a clear statement of the problem. Essentially, the tool engineer would like to know which steels are most popular, most readily available, and which will best perform the services required.

As long as there are a number of producers actively engaged in making tool steels, there will be an opportunity of securing a specific modification for each application where it can be shown to do a better job than any other steel.

There are those who, because of their desire to produce a working set of specifications and to permit

Fig. 1. Cold heading operation on ½ x 5-inch hex head cap screw uses open dies and two blows. Such dies are commonly made of water-hardening tool steels. *—Photo Courtesy Rockford Screw Products Co.*

*Senior member ASTE Pittsburgh chapter.

Table 1—Composition of Water Hardening Steel Groups

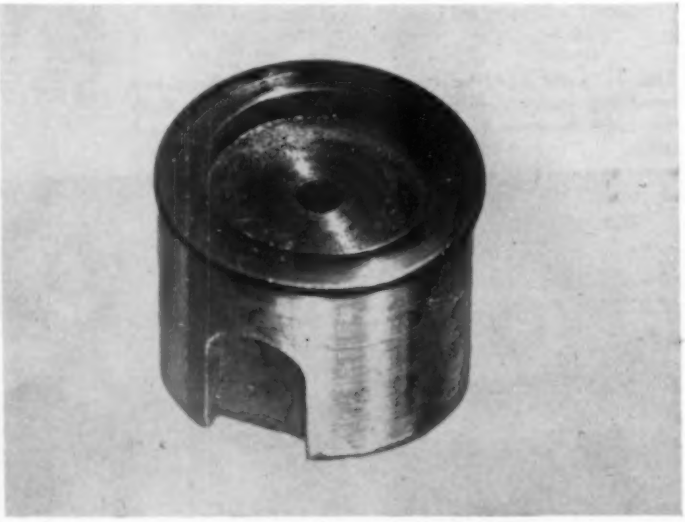
Steel Group	Carbon (%)	Chromium (%)	Vanadium (%)
W1	0.60 - 1.40*	—	—
W2	0.60 - 1.40*	—	.25
W3	1.00	—	.50
W4	0.60 - 1.40*	.25	—
W5	1.10	.50	—
W6	1.00	.25	.25
W7	1.00	.50	.20

*Varying carbon contents available. Usually offered in 0.90 to 1.10-percent carbon range.

a written description of these products in simple terms for engineers and purchasers, would like to see the situation resolved by having only one, two, three, or certainly no more than five individual water hardening tool steels. Although a relatively few grades of carbon tool steel can be made to perform with utmost efficiency in any one plant, this aim is neither desirable nor possible of achievement when all industry is considered.

Many factors are involved in this problem. Among them is the desire of each user to machine, grind, heat-treat or otherwise employ the steel in a particular manner unlikely to be encountered in another plant on the same operation. The influence of design practices alone upon selection is great. Tool steel engineers are frequently called upon to select a steel for dies or tools of radically differing design, yet performing essentially the same function and it proves necessary to select different carbon contents, different hardenabilities or even different levels of vanadium content to give optimum production.

Fig. 2. Cold heading die of 1.00-percent carbon, special quality tool steel, used to cold head ⅛-inch stock.



Further, the different basic qualities of carbon tool steel cannot be readily eliminated or changed by the mere statement of a desire for more rationality. There are many applications in industry which require nothing but the basic quality of the standard brand of carbon tool steel. There are, however, a great number of specific exceptions in which a narrow range of hardenability, perfect uniformity across the macro-section of the bar stock or forging, an extremely narrow carbon content or an extremely low metalloid or inclusion content are absolutely required. Where these factors are known to exist it would be folly for the consumer to avoid specification of the steel he actually needs to conform to a national pattern of a limited number of grades.

From the standpoint of the tool steel producer, a limitation would be a benefit. Warehouse stocks would be simplified and, in at least a few instances, deliveries would be improved. These advantages, however, are minor, and would reflect themselves in only a temporary, minor saving to the user. The tool steel industry would still, or eventually, be required to produce these special, selected limited quantity items where needed for optimum productivity.

Knowledge of Tool Steels Needed

Granting these points it is agreed that there is considerable benefit to be gained by a more thorough understanding of water hardening tool steels and their modifications. This need for detailed and rational information about carbon tool steels is the important point to be developed from the many group discussions taking place at this time. That is likewise the main purpose of this discussion.

First of all, the water hardening tool steels fall into a variety of different basic groups, TABLE 1. The first group is, of course, the plain carbon tool steels containing about 0.60 to 1.40-percent carbon. In carbon tool steel metallurgy the presence of any element should rightfully be considered as an alloying element, since the effect on hardenability of even small quantities is great. Thus, the silicon, manganese, chromium, nickel, molybdenum and vanadium contents that may be present must always be considered for their alloying effect. In this first group, however, essentially no alloying elements, other than silicon and manganese, are specifically added to affect the properties, although those present may be under close metallurgical control.

The most important variable in this group of steels is the carbon content itself. Most charts indicate that the carbon content of plain carbon tool steels will vary from 0.60 to 1.40 percent. In actuality, little is made with less than 0.80 percent and only a small amount is made with more than 1.25 percent carbon. Most production is confined to a relatively narrow range of carbon, between 0.90 and 1.10 percent. The carbon content is often referred to as "the temper" of these steels and one simple identification system of the carbon content is frequently based on

Table 2—Hardenability of W1 and W2 Steels (Shepherd PF Test*)

Hardenability Depth	Temper Designation 8 and 9	10, 11 and 12
Shallow	10 max	8 max
Regular	9 to 13	7 to 11
Deep	12 min	10 to 16

*Performed with a specimen ¾-inch diameter x 3-inch; 1600 F oil quench; 1450 F water quench; rate hardenability by measuring depth of hardened case on cross section at midpoint of length in 64ths of an inch.

a temper designation. Thus, 9 temper represents a 0.90-percent carbon steel; 10 temper, a 1.00-percent carbon steel; and 11 temper, a 1.10-percent carbon tool steel, etc.

The second group of water hardening tool steels is the carbon-vanadium steels, containing from 0.15 to 0.35-percent vanadium. Their nominal composition is 0.20-percent vanadium. The addition of vanadium is primarily intended to refine the grain size. It permits the use of a slightly higher hardening temperature, without danger of undue grain growth and because, it refines the grain size, it undoubtedly imparts added toughness to the hardened tool. Vanadium adds somewhat to the wear resistance of carbon tool steels, although this is a minor effect completely overshadowed by the potential increase in wear resistance given by higher carbon contents or higher hardnesses. For the most part the carbon-vanadium steels in the W2 class are made with 0.20-percent vanadium and with either 0.90 or 1.00 percent of carbon. Little carbon-vanadium steel is made in 7 or 8 temper and little is made with a carbon content greater than 1.15 percent. Indeed, the carbon-vanadium steel that is readily available is in the 9 temper classification with a carbon content range from 0.85 to 1.00 percent.

A third group of these water hardening steels is made possible by the addition of almost twice the amount of vanadium that appears in W2. This steel, W3, sometimes called "double-vanadium" steel and formerly identified by the suffix VV, contains from 0.35 to 0.50-percent vanadium. The steel was originally developed for specific application to cold heading dies, *Fig.* 2, where it was desired to employ steel that could be hardened from temperatures as high as 1750 F without grain growth. This permitted a considerable variation in the hardenability or depth of hardening characteristics of the steel through a change in the hardening temperature and avoided the expensive practice of carrying a great number of different grades with different hardenabilities in inventory. Thus, the steel when hardened from 1420 F is shallow hardening and fine grained. When hardened from 1600 to 1700 F it is deeper harden-

Fig. 3. Section of die shown in *Fig.* 2, etched to indicate depth of case. The dark grey portion near the center hole is hardened. Die was quenched by water flowing through center hole. No water impinged on the full faces of the ends or OD of die. Center hardness is R. 59-60.

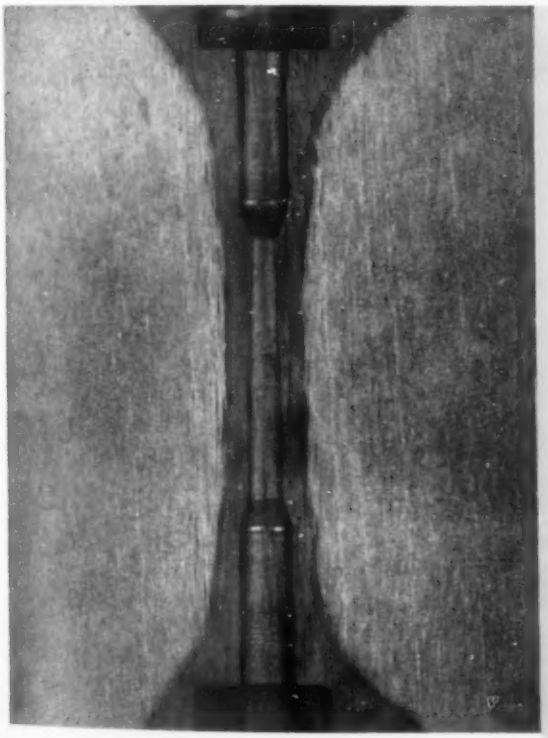
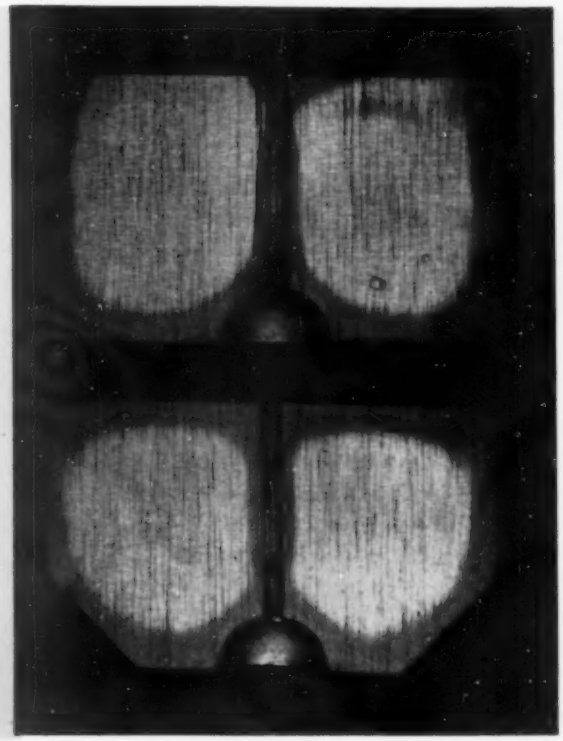


Fig. 4. Section of cold heading die for manufacture of steel balls. Die is made of 1.00 per cent carbon, 0.20 percent vanadium, special quality tool steel. Hardenability is 9-11 Shepherd PF, produced by quenching all over with some of water directed through the center hole for ID case.



ing but still fine grained, whereas W1 or W2 water hardening steels previously discussed would have a coarse grain from this latter hardening temperature range.

Another device used to increase the hardenability of steels is the intentional addition of specific alloying elements. For carbon tool steels this addition is largely confined to chromium. Two other groups of steels are thus possible, depending upon the chromium level: one containing 0.20-percent chromium, W4, and one containing approximately 0.50-percent chromium, W5. This same increase in hardenability could be accomplished by a change in the silicon or manganese contents or by the addition of nickel or molybdenum. Trade acceptance of the grades with chromium is highest, however.

Table 3—Hardenability Characteristics of Typical Steels

Industry Grade	Temper	Quality	Hardenability*	Typical Designation
W1	10	1	7 - 11	Colonial No. 14 - 10
W1	10	3	No	Red Star - 10
W2	9 or 10	1	6 - 10	Colonial No. 7 - 9
W2	10	3	No	Red Star Vanadium - 10
W3	10	1	7 - 11	Colhed
W4	10	1	9 - 13	Colonial No. 14 with Cr
W5	11	3	No	Red Star with Cr

*Shepherd PF Test (See TABLE 2)

Finally, of course, two other grades are possible in which combined additions of chromium and vanadium are made, W6 and W7. These steels are relatively less popular and are used only for special applications. In most of the grades containing chromium or chromium and vanadium, the carbon content is approximately 1.00 percent.

A major feature of the water hardening steels is the hardenability itself. Any one of the above grades can be produced with varying hardenabilities. Specifically carbon and carbon-vanadium steels of the W1 and the W2 types are available with different hardenability levels. The other steels are offered with a more limited range of hardenability and are usually designed to have a specific hardenability by virtue of their chemical composition.

Hardenability can be made to vary over a wide range. In an attempt to standardize or to apply some definite nomenclature to these hardenability levels, the terms shallow, regular and deep, with the symbols S, R, and D, respectively, were adopted several years ago. A detailed table (summarized in TABLE 2) was prepared showing the hardenability as determined by the Shepherd test for the shallow, regular and deep steels as a function of the carbon content. In general, the lower the carbon content the deeper will be the hardenability, *Figs.* 3 and 4.

These terms need not be employed at all, since the user has the possibility of specifying and should specify the exact hardenability desired. The terms are intended to indicate to the user what ranges of hardenability are commonly available. As a matter of fact, for most of the first quality carbon and carbon-vanadium tool steels available in warehouses 10 temper carbon steel is generally stocked with a hardenability of 7 to 11 and 9 temper carbon-vanadium steel, with a hardenability of 6 to 9. Hardenabilities outside these limits must be specially negotiated and obtained from mill shipments. For a greater depth of hardened case, one may purchase steels containing chromium or use the double-vanadium steel, W3, and a higher hardening temperature.

Finally, with respect to quality control generally three regular qualities are available, as follows:

1. SPECIAL—The highest quality water hardening tool steel; controlled for hardenability; held to the closest chemical limits; and subject to most rigid tests to insure maximum uniformity and performance
2. EXTRA—A high-quality water hardening carbon tool steel; controlled for hardenability; subject to tests to insure good service for general application
3. STANDARD—A good-quality water hardening carbon tool steel; not controlled for hardenability; recommended for application where some latitude of uniformity is permissible.

TABLE 3 lists generally available carbon and carbon-vanadium tool steels and includes all special characteristics that might be of interest to a user. This is given as a guide. Other qualities are readily available by special negotiation and usually available from billet stock held at mills.

Avoiding Tool Failures With Negative Rake

ALTHOUGH the conclusions arrived at by Max Kronenberg, were sound (THE TOOL ENGINEER, Jan. 1955, pp 83-87), the derivations of the equations on which the conclusions are based were clouded by typographical errors in Eq. 6, 7 and 8.

Following are the equations in correct form:

$$\ldots = \frac{2R}{r}\left(\frac{\cos\frac{\beta}{2}\cos\gamma}{\beta+\sin\beta} + \frac{\sin\frac{\beta}{2}\sin\gamma}{\beta-\sin\beta}\right) \quad \ldots\ldots(6)$$

$$\frac{\sin\frac{\beta}{2}\sin\gamma}{\beta-\sin\beta} = -\frac{\cos\frac{\beta}{2}\cos\gamma}{\beta+\sin\beta} \quad \ldots\ldots(7)$$

$$\tan\gamma_{max} = \cot\frac{\beta}{2}\left(\frac{\beta-\sin\beta}{\beta+\sin\beta}\right) \quad \ldots\ldots(8)$$

with γ being positive when resultant R is below the bisector.

In addition, the last complete sentence on page 85 should read: "The angle $\omega_{max} = \beta/2 + \gamma_{max}$, where tan ω_{max} is equal to the magnitude of the friction force."

Efficiency Ratio, (lb metal removed / lb wheel loss)

How to select the best grinding wheel

By **John A. Mueller**

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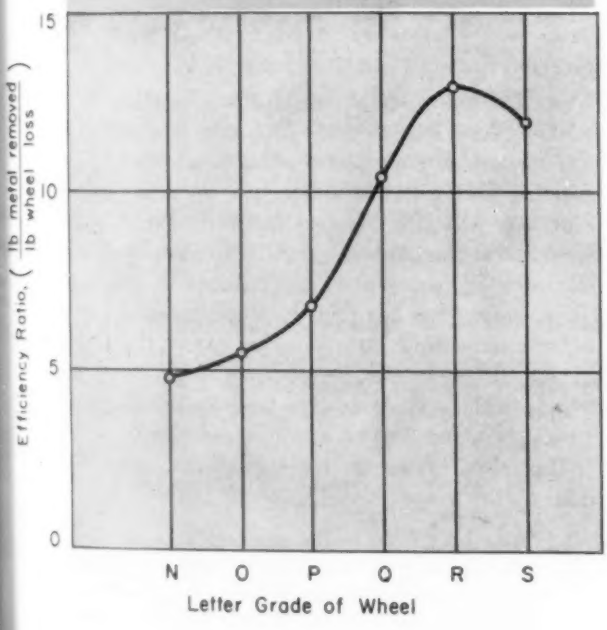


SINCE GRINDING WHEELS are required to perform many types of abrasive operations under varying conditions and because there are so many types of wheels, selection of the correct wheel can pose a problem. As a solution to this problem, a method has been developed for testing wheels and recording the data so that the proper type can be specified for a particular operation.

To understand the problem of wheel selection, the operating characteristics of available choices must be known. Demands on grinding wheels include among others:

1. Removal of metal
2. Generation of forms
3. Production of finishes
4. Maintenance of flat and dimensionally accurate surfaces to close tolerances.

Grinding operations have a wide range. In snagging, wheels may remove as much as 60 lb of steel per hour, while in precision grinding, wheels remove little material but produce finishes as fine as 1 to 2 microinches rms. Often, wheels must also be capable of maintaining dimensional tolerances as close as 25 millionths of an inch.

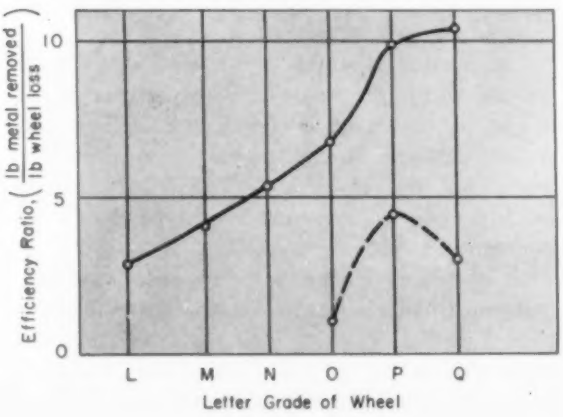
To meet this range of performance specifications, a large number of wheel shapes, sizes and grades are required. Although the total number of grades produced is extremely large, grinding wheels consist of only five variable elements. These elements can be most readily identified by examining the specifications of a typical grinding wheel used for surface grinding, namely, grade AA46 H6 V10. These specifications have the following significance:

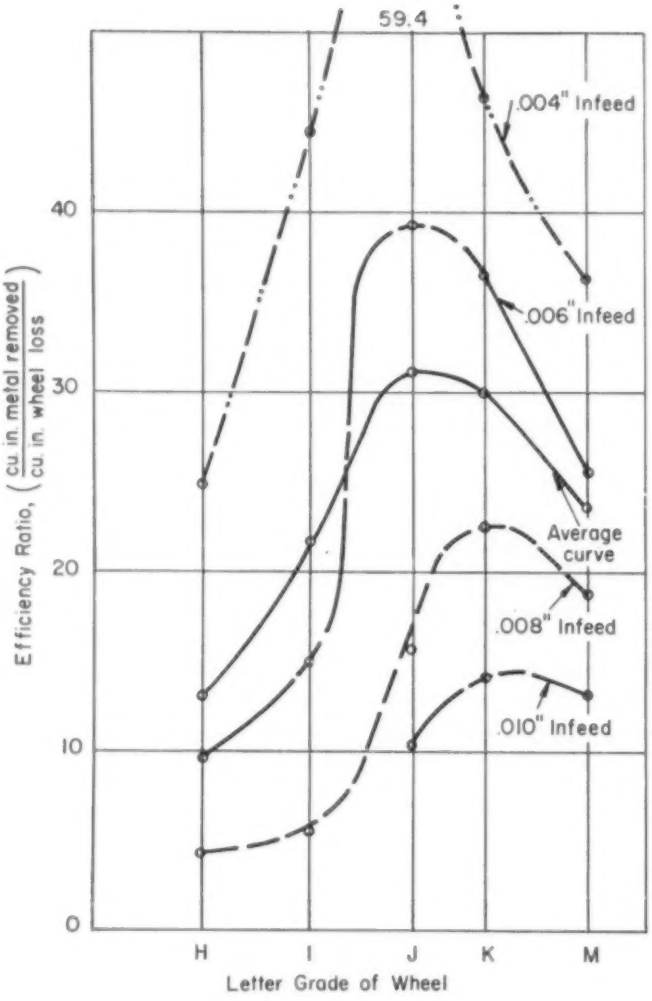
AA is the abrasive grain type (chemically pure white aluminum oxide)
46 is the abrasive grit size
H is the hardness or wheel grade
6 is the structure or grain spacing of the wheel
V10 is the bond type (vitrified)

With the extreme range of abrasive requirements to be met and with a multiplicity of wheels from which to choose, the question arises as to how to select the proper grinding wheel for a specific job.

Fig. 1. (left) Grade-Action curve for a snagging operation with a 12-grit, aluminum oxide, resinoid bond grinding wheel, 20 x 2½ x 6-in. size. A swing-frame grinder was used at 9500 sfm and material was cast steel, ASTM A27-46T.

Fig. 2. (below) Comparison of light (solid line) and heavy (dash line) snagging operations with a 14-grit, aluminum oxide, resinoid bond grinding wheel. Other conditions are same as in *Fig.* 1.





Experience will narrow the selection of wheel possibilities but to pinpoint the selection to the optimum wheel grade even an expert must test at least several varieties. The technique employed by the expert in wheel selection is also available to the less experienced. It entails plotting a "Grade-Action" curve.

Grade-Action curves generally cover enough grades to adequately describe wheel action and include a range of wheel grades from those known to be too soft for the particular operation to those that are too hard. Such a curve can be used to adequately and accurately evaluate wheel performance on any type of operation.

The number of wheels to be tested will often be influenced by the amount of experience in the operation. The over-all significance of the Grade-Action curve is that it points up a satisfactory wheel for the abrasive operation and exposes quickly a wheel or even a bond type that is less economical to use.

Grade-Action curves for snagging operations performed under different conditions are shown in *Figs.* 1 and 2. *Fig.* 1 shows the ratio pounds of metal removed per pound of wheel loss for a given time, plotted as a function of wheel grade or hardness. The ratio, metal removed to wheel loss in a unit of time, is a measure of production rate and the amount of work that a wheel is capable of performing during its useful life.

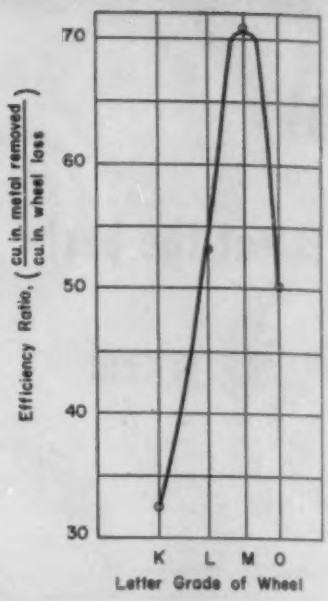


Fig. 3. (left) Influence of infeed on Grade-Action relationship in centerless grinding. Operation used a wheel 20 x 4 x 12-in. aluminum oxide, 60-grit vitrified bond type, at 6400 sfpm, 2-deg angle of draw and regulating wheel speed of 100 sfpm. Material was SAE 3145.

Fig. 4. (above) Grade-action curve for same conditions as *Fig.* 3 except 80-grit wheels were used instead of 60 and only one feed rate was plotted.

A soft wheel is revealed to be relatively inefficient but as the hardness of the wheel increases, the efficiency increases until a maximum is reached. Then, despite the fact that the wheel becomes harder, efficiency drops off. In other words, the curve in *Fig.* 1 traces the performance of a series of wheels in the same bond type from low efficiency to a maximum and then back to lower efficiency.

The curve represents three phases of wheel action:

1. From the soft grade, low efficiency wheel, to where the curve begins to peak, the wheel is constantly breaking down, but at a rate that is too rapid for most economical usage of the abrasive. On this part of the curve the wheel does not load appreciably, neither does it produce excessive burn on the work.
2. At the peak of the curve the wheel is continuously breaking down at such a rate that the most effective use of the abrasive is made. Before the grains in the wheel face have become dull to the extent that the cutting rate is retarded, the grains are released by the bond and new sharp grains are exposed to the work.
3. On the hard side of the curve, discontinuous breakdown occurs. This consists of the wheel loading and unloading in cycles, accompanied by pressure build-ups and recesses. An increase in temperature

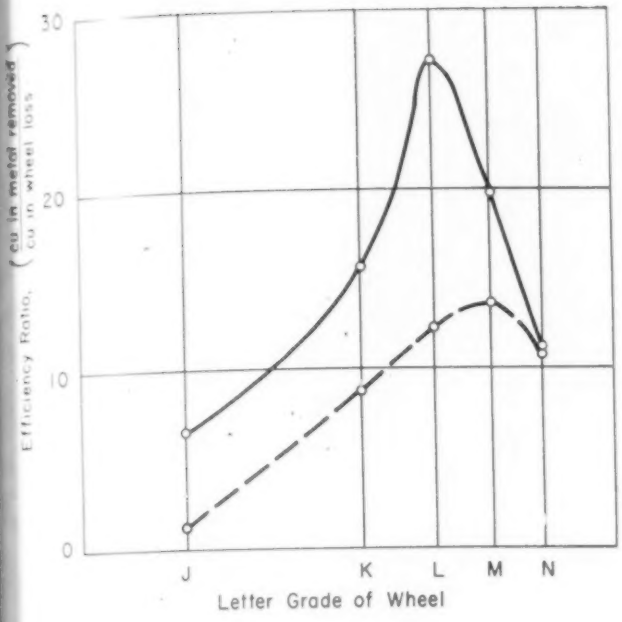


Fig. 5. Grade-Action curves for center-type cylindrical grinding at 29-ipm table feed (solid line) and 61 ipm (dash line). Operation used a wheel 14 x 1½ x 5-in. aluminum oxide, 465 grit, vitrified bond, at 6400 sfpm, work speed 70 sfpm. Material was A4142 (41 Rockwell C).

results, the wheel burns the work, cutting rate is decreased and more power is consumed.

The Grade-Action relationship can be applied, therefore, to reveal the grade of wheel that operates most efficiently on any grinding operation.

Wheel performance, as indicated by the Grade-Action relation, is not restricted to bond type, grain, grit size or to any specific grinding operation. This is borne out by the comparison of the two typical, but widely different, snagging operations given in *Fig.* 2.

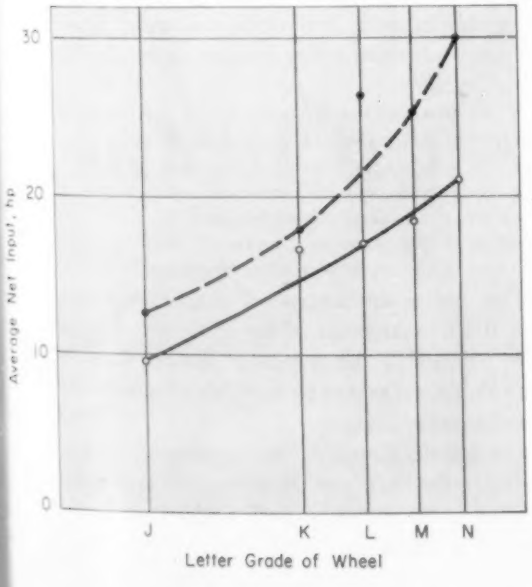
The solid-line curve in *Fig.* 2 is a relatively light operation that is typical of swing-frame grinding where additional weights are not used on the machines. The characteristic curve is evident, with the rate of increase in efficiency dropping off as the wheel hardness reaches grades P and Q. At grades harder than Q the performance of the wheel drops.

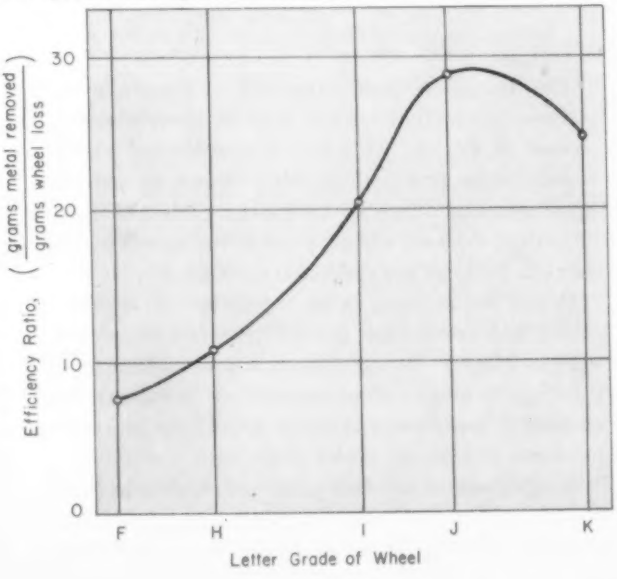
The dashed curve is an example of the same bond type as the first, but represents a heavier operation that is typical of swing-frame grinding where additional weights are used on the machines to reduce operator effort. The curve is significant because it reveals a low performance ratio, in comparison with the first curve, and the optimum grade is quickly reached. In a practical sense, the curve comparison indicates that this particular bond is unsatisfactory for such heavy operations and that a more durable bond is desirable.

The Grade-Action characteristic curve applied to centerless cylindrical precision grinding is shown in *Figs.* 3 and 4, under different grit size conditions. *Fig.* 3, which illustrates a roughing operation with a 60-grit wheel, shows a family of curves based on increasing infeeds from 0.004 to 0.010 inch. It not only indicates the relative performance of grinding wheels of different grades, but also reveals the effect of infeed on the performance of a wheel. For instance, the optimum grade of wheel shifts to harder wheels when heavier cuts are taken. This is

Fig. 6. (left) Power consumption for the two grinding conditions represented in *Fig.* 5.

Fig. 7. (right) Composite Grade-Action curve for surface grinding high-carbon high-chrome die steel, Rockwell 59 C, at various infeeds. Operation performed with 8 x ½ x 1½-in. wheel, chemically pure, white aluminum oxide, 46 grit, vitrified bond, at 6000 sfpm, table speed of 20 fpm and 0.0625-in. crossfeed.





Comparison of Metal Removed to Wheel Loss in Surface Grinding at Various Infeeds with Various Wheel Grades

Wheel Grade	0.002" Infeed			0.004" Infeed			0.006" Infeed			0.008" Infeed			0.010" Infeed			0.012" Infeed			0.015" Infeed			Average Ratio
	M.R.	W	Ratio	M.R.	W	Ratio	M.R.	W	Ratio	M.R.	W	Ratio	M.R.	W	Ratio	M.R.	W	Ratio	M.R.	W	Ratio	
F	8.34	0.99	8.4	15.79	2.11	7.5	17.21	3.43	5.0	Wheel too soft to continue			—	—	—	—	—	—	—	—	—	7.1
H	7.82	0.75	10.4	17.23	1.39	12.4	24.65	2.14	11.5	32.43	3.27	9.9	38.66	4.20	9.2	Wheel too soft to continue			—	—	—	10.1
I	8.80	0.50	17.6	17.13	0.85	20.2	24.40	1.20	20.3	33.05	1.46	22.6	41.22	2.04	20.2	51.04	2.29	22.3	61.26	3.14	19.5	20.4
J	9.44	0.40	23.6	16.12	0.57	28.3	25.98	0.88	29.5	33.00	1.09	30.3	40.75	1.26	32.3	49.69	1.72	28.9	61.39	2.07	29.7	28.9
K	9.26	0.41	22.6	16.81	0.68	24.7	26.46	1.02	25.9	34.39	1.25	27.5	40.49	1.68	24.1	51.71	1.96	26.4	64.00	2.92	21.9	24.7

Note: Wheel Grades: All AA46—; Machine: Horizontal Spindle Surface Grinder; Wheel Size: 8" x ½" x 1½"; Wheel Speed: 6000 sfpm; Table Speed: 20 fpm; Crossfeed: 0.0625"; Material Ground: High carbon, high chrome die steel hardened to Rc 59. Key: M. R.: Metal Removed (grams); W: Wheel Loss (grams)

Plotted in Fig. 7.

logical and is true in actual practice because grinding pressure is greater the heavier the depth of cut. Harder grades are therefore required to maintain wheel life and optimum performance.

On the other hand, *Fig.* 4 is a light operation performed with an 80-grit wheel. Just as in the roughing operation, *Fig.* 3, the same wheel action takes place in the finishing operation, ranging from low to maximum and back to low efficiency. The efficiency ratio varies greatly with change in grade, however, much more so than when 60-grit wheels, *Fig.* 3, are used.

Center type cylindrical grinding also indicates a typical Grade-Action relationship, as shown in *Fig.* 5. Again, two conditions are appraised—the solid curve represents a metal removal rate of 0.3 cu in per min. (29 ipm table speed) and the dashed curve a metal removal rate increased to 0.6 (61 ipm table speed).

While both curves follow the familiar Grade-Action relationship, a number of additional observations can be made in comparing the two curves:

1. The more severe the operation, the less efficient the wheels are, grade for grade.
2. The optimum grade for the more severe operation (dash line) is not the optimum grade for the less severe; the heavier operation requires a harder grade wheel.

The amount of power required to remove metal at these production rates is also of interest and is plotted in *Fig.* 6. This shows that harder wheels require more power than softer wheels to remove equal amounts of metal. In applying a wheel to an operation, the best wheel to use is the softest grade that can perform the operation satisfactorily.

Power requirement is an indication of freedom of cut and reflects the general performance of the wheel. Harder wheels create more friction and therefore consume more energy but a substantial amount of this energy is transformed into heat and produces little or no useful work.

Comparison of power inputs, in conjunction with a study of Grade-Action characteristics, provides a realistic analysis of wheel performance and suggests a method of selecting wheels to obtain optimum operating performance.

Surface grinding is a precise form of grinding where dimensional accuracy and form-holding ability are important properties of a grinding wheel and must be considered in wheel selection. The Grade-Action curve is particularly helpful in identifying wheels that will maintain form and produce flat surfaces at optimum efficiency.

Grinding hardened high-carbon high-chrome die steel is represented in *Fig.* 7, using a series of wheels made from chemically pure aluminum oxide grain. The curve shows a definite progression in efficiency vs. wheel grade and reaches a maximum at grade J. The table presents additional data relating to *Fig.* 7 and shows the influence of infeed on the average curve plotted in the figure. At all infeeds, the Grade-Action characteristic relationship is observed.

The relationship was found to cover a wide range of abrasive wheel applications. The metals ground included soft cast steel, high-carbon high-chrome hardened die steel, nickel-chrome steel and chrome-moly steel. Resinoid and vitrified wheels were tested on both rough and precision grinding. Precision grinding data included surface and cylindrical grinding, both centerless and center types. Three practical conclusions can be drawn as follows:

1. For any grinding operation there is a specific wheel grade that will perform at maximum efficiency.
2. For any series of wheels of a particular bond type, one wheel grade will outperform the other wheels in the series for a particular operation.
3. A Grade-Action curve is a means of pinpointing the optimum grade for any grinding operation.

Another useful application of the Grade-Action curve is the measurement of the efficiency of items that are related to the grinding process such as grinding fluids, resistance to abrasion of metals and nonmetallic materials, etc.

This makes the Grade-Action curve a useful tool to determine the optimum wheel for any operation. It can also be employed to find out how efficiently a wheel is operating.

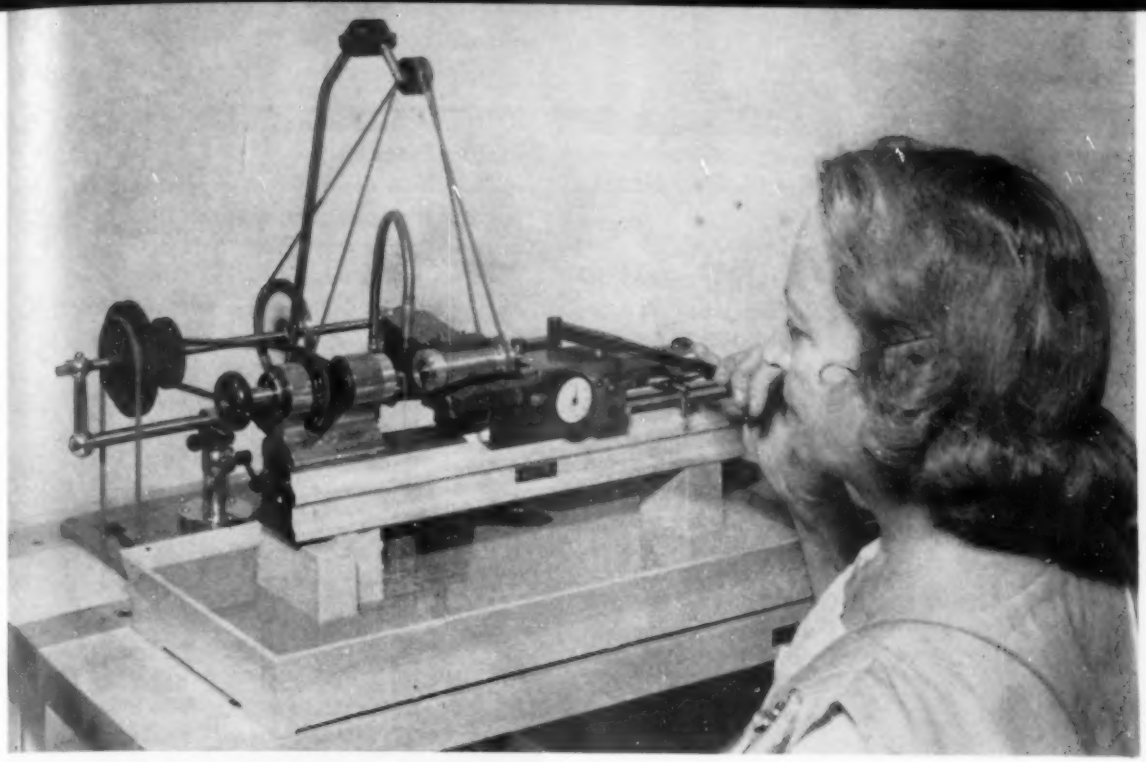


Fig. 1. Watchmaker's lathe equipped with a microdrilling attachment. Collet at right holds pivot drill, while opposing collet contains workpiece. Both collets revolve during drilling.

Precision Drilling of small holes

By Samuel Levin

Louis Levin and Son, Inc.
Los Angeles, Calif.

ALTHOUGH TECHNIQUES are standardized for drilling large holes, little information has been available for small hole drilling. Need for precisely drilled small holes, however, has been increasing rapidly. A small hole, as considered in this article, is one whose diameter is 0.040 inch or less.

To make a large hole, the work may be centered, drilled, reamed and finish ground. When a drill jig is used, the centering operation may be omitted. To make a small hole, say 0.008-inch diameter, secondary operations for truing the hole or drill jigs for correctly locating it cannot be used. It must be properly centered and drilled correctly, *Fig.* 1. The only possible correction is to enlarge it with another drill or reamer.

Twist Drills: Two basic types of drills are available for small hole drilling. They are twist drills and pivot drills, usually measured in millimeters of diameter. Twist drills range in size from 0.15 mm (0.0059 inch) to 0.30 mm (0.0118 inch) in increments of 0.01 mm (0.00039 inch). Larger drills up to 0.50 mm are made in increments of 0.02 mm. From 0.50 mm to 1.00 mm, the increments are 0.05 mm.

In these small sizes, twist drills are most useful for continuing holes which have been started by other drills. Also twist drills are used for enlarging

holes or for drilling short holes in tough materials. They tend to buckle, however, even under moderate pressure because of their extreme length in relation to diameter and relatively thick web.

Pivot Drills: For starting holes and microdrilling thin or tough materials, the watchmaker's type of pivot drill is preferable to a twist drill. This drill is usually made with an oversize shank to fit standard collets. Length of the drill portion is about seven times the drill diameter. The drill is also back tapered so that it cuts freely. Because the fluted portion of the drill is short, a pivot drill is more rigid than a twist drill of corresponding size. While

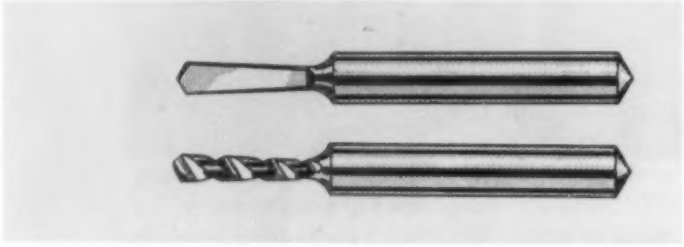


Fig. 2. Two types of pivot drills for producing small, close-tolerance holes. Above is a flat spade drill and below, a spiral fluted drill.

this increased rigidity is an advantage, it is exceedingly important that the drill runs true. A twist drill is sufficiently flexible to compensate for slight misalignment or wobble. A pivot drill, however, must run true and be in alignment or it will break.

Pivot drills are made in sizes from 0.04 to 1.00 mm in increments of 0.01 mm. All drills in this range have shanks with 1.00 mm diameters to fit the same collet. Larger pivot drills are made but they have no particular advantage over twist drills.

Two styles of pivot drills are generally used. They are the flat spade drill and the spiral fluted type, *Fig.* 2. Flat drills are best for centering and for starting holes. The choice between the two depends on the nature of the operation and the material being drilled. Because the web of a pivot drill is thinner than that of a twist drill, pivot drills cut more freely. This is why they are useful for starting holes which will be deepened later with twist drills.

Microdrilling: Conventional drill chucks are not suitable for microdrilling. An adjustable chuck usually will not close sufficiently and it cannot be made with sufficient accuracy. A runout of 0.005 inch at the end of a ¼-inch drill may not be serious but a similar runout in a 0.005-inch drill means that the center of the drill would be describing a circle as great as its own diameter. Therefore, the preferred method of holding such small drills is to use jeweler's lathe collets. With a capacity as small as 0.004 inch, these collets hold drills within a runout of 0.0001 inch.

To drill a concentric hole perpendicular to the plane of the work, it is necessary to revolve both the drill and the work. Also, it is desirable to know when the drill contacts the workpiece. A microdrill cannot withstand the shock of abrupt contact with the work. As the hole becomes deeper, requiring withdrawal of the drill to clear accumulated chips, the drill must re-enter the hole and resume drilling without bumping into the bottom of the hole.

The drilling attachment illustrated in *Figs.* 1 and 3 is designed for use by comparatively unskilled operators. The feeding mechanism cannot transmit to the drill the full pressure exerted by the operator. When the feed handle, *Fig.* 3, is pulled the slide carrying the drill is kept against a stop screw in the graduated knob. This releases a stop screw and the slide can move only as fast as the knob is turned. After chips are cleared upon withdrawal of the slide, the drill is prevented from striking the bottom of the hole by this stop screw. A separate stop screw is set to control the final depth of the hole.

To facilitate precision alignment of the drill with the lathe spindle, the attachment has two slides. One adjusts the drill spindle for vertical alignment and the other corrects for horizontal position. *Fig.* 3. To make these adjustments, a small rod with a fine pivot is inserted in a collet in the lathe head and a similar rod is placed in the drilling spindle. When the two pivots are aligned they have the appearance of a single hair line.

With precision alignment and sensitive feed, it is possible to drill without first making a center. The workpiece surface, however, must be smooth so that the drill will not catch in a groove left from a previous operation.

Cutting Speeds: Ordinarily, the speed of a drill is increased as the diameter of the drill is decreased. In the case of microdrills, this no longer holds true. As the drill becomes smaller, speed must be reduced. For example, when drilling a 0.005-inch hole in tool steel, the drill speed should be no greater than 2500 rpm.

Conditions of each individual job vary so much

Cutting Speeds for Drilling Tool Steel with HS Steel Pivot Drills

Drill Dia. (mm)	Feed (fpm)	Speed (rpm)
0.3	6.5	5000
0.5	9.0	4500
1.0	13.5	3200
1.5	21.0	2500
2.0	26.0	2300
2.5	31.5	2250
3.0	37.5	2200

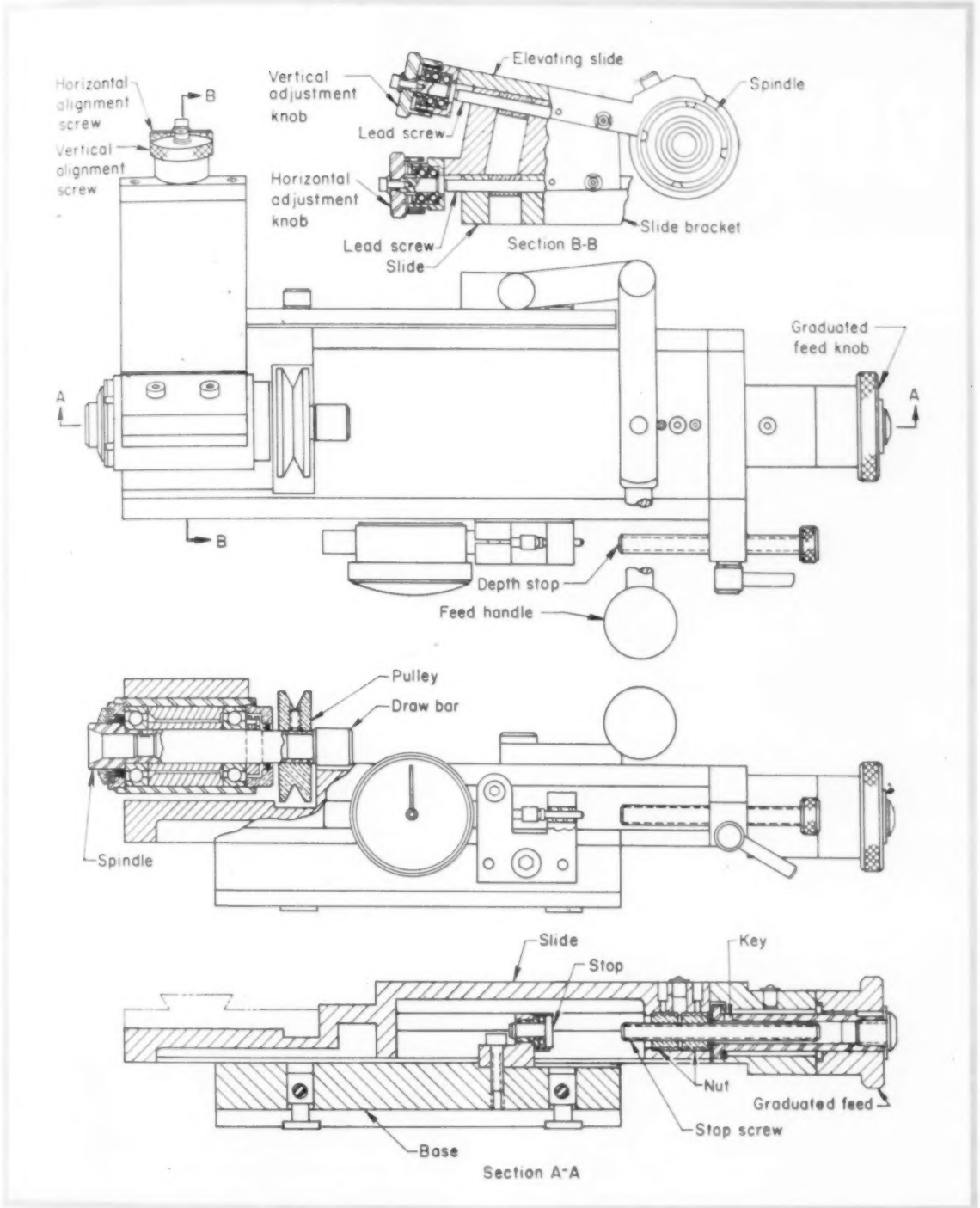


Fig. 3. Drawing showing spindle, stops and adjustments for a micodrilling attachment.

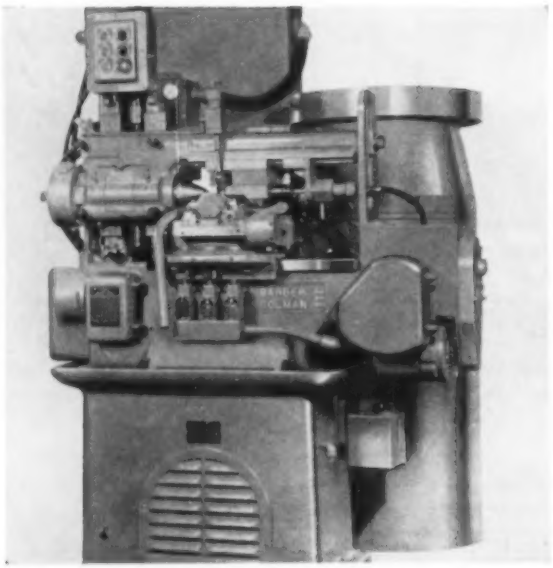
that an exact determination of speeds for a given job is a matter of cut and try. One of the most frequent causes for failure in small hole drilling is the use of excessive spindle speeds in an attempt to maintain a given surface speed. At high speeds the drill does not have enough mass to dissipate the heat generated and the cutting edge is abraded by excessive rubbing rather than being dulled by excessive chip formation. Like any other cutting tool, a microdrill works properly when it cuts a definite chip.

Shown in the accompanying table are recommended speeds and feeds for drilling tool steel with high-speed steel pivot drills. Speeds are critical only on hard or tough materials. On soft materials like brass or aluminum a great deal of variation is permissible. Usually the only limit is the maximum limit of the machine.

designed for

PRODUCTION

Automatic Hobbing Machine designed for high production

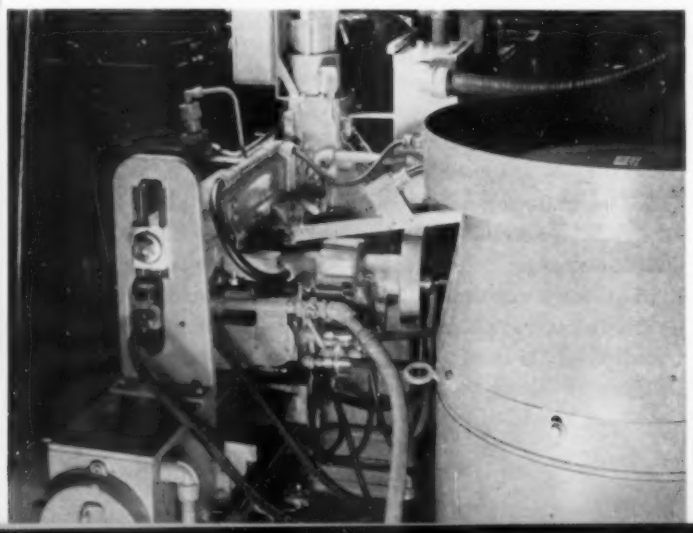


AUTOMATIC HOBBING MACHINE, tooled for cutting automatic transmission gears on a high production basis, has a combination of electric limit switches and a program motor to govern the automatic cycle. This type of cycle arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending on the particular gear specifications and production requirements.

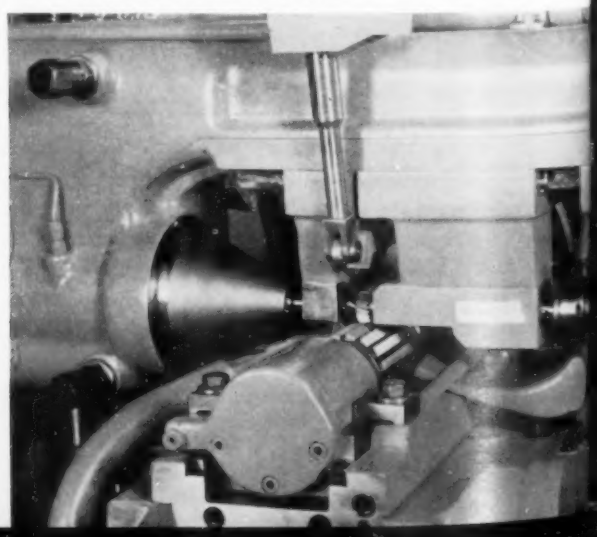
OPERATING automatically through a combination of mechanical, hydraulic and electrically controlled movements; feed, index and hob speed are mechanically governed on this horizontal hobbing machine, as on conventional machines also built by Barber-Colman Co., Rockford, Ill. The work slide movements, automatic clamping and arbor loading are hydraulically operated, while cycling and rapid traverse are electrically actuated. Automatic loading is accomplished through a vibratory hopper feed system on this Model 6-10.

In the complete cycle, blanks are automatically loaded and hydraulically clamped in cutting position, and the hob is rapid traversed to the hobbing position. The work slide is lowered to cutting depth, the gear is hobbed, the work slide is raised to clear the hob, the hob is rapid traversed away from the cut and the finished gear is automatically ejected. A new blank is then automatically loaded and the cycle continues to repeat itself.

SOLID OVERARM BRACE adds rigidity to the machine and, since gear blanks are loaded on a solid work arbor, chances for looseness, runout and vibration are lessened. Chute in center foreground feeds blanks from the vibratory hopper to the hydraulic arbor-loading mechanism. Another feature of the machine is metered hydraulic pressure that assures positive arbor mounting and finished gear ejection.



GEAR IN CUTTING POSITION on the automatic hobber. Tube in left foreground is used as chute to automatically eject finished gears. The machine has an automatic hydraulically operated hob shifter that increases the cutting life of the hob while avoiding the necessity for manually moving the hob to new cutting positions. The shifter moves the hob to a new cutting position after each gear is cut. Shift increments can be regulated during setup.

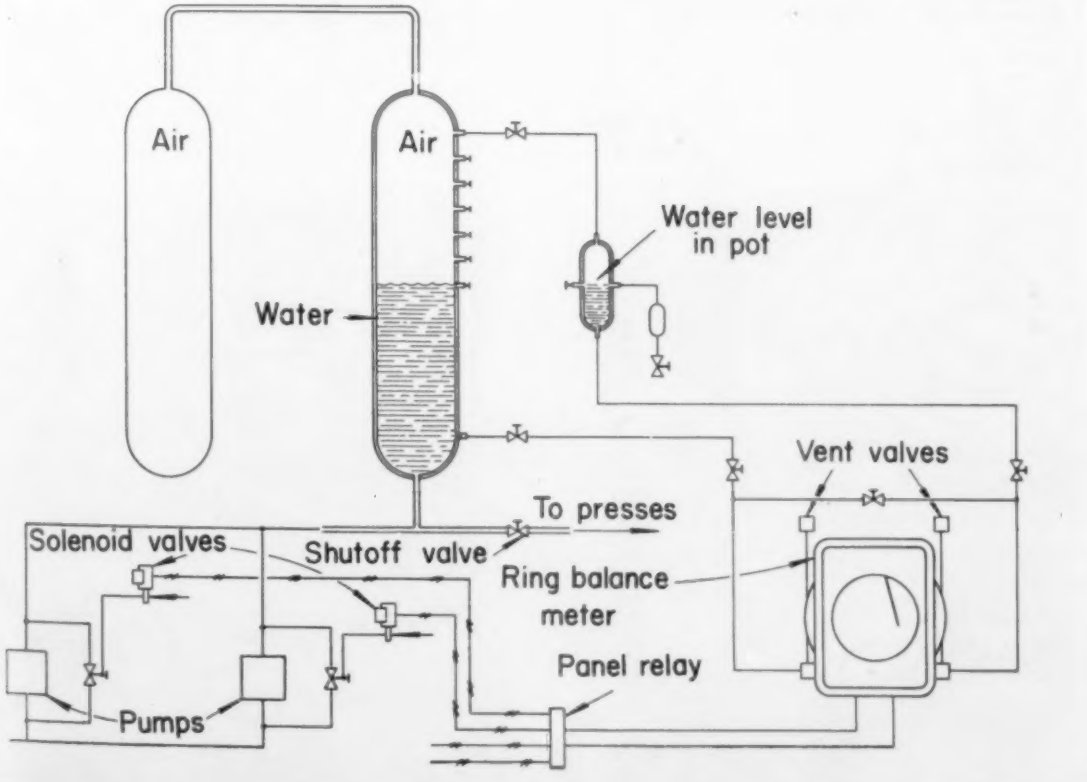


FLOW METER Adapted for Hydraulic Press Pump Control

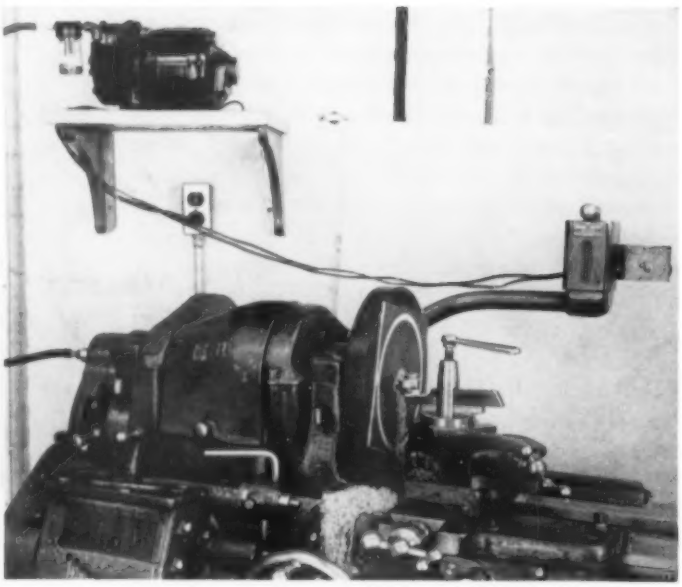
COMMONLY used for all types of flow metering, the Ring Balance Meter manufactured by Hagan Corp., Pittsburgh, Pa., is now used to control the water level in high-pressure bottle accumulator systems supplying storage for pumps used to operate high-pressure hydraulic presses of 2000 psi and upwards. Accumulator bottles are air loaded rather than individually loaded piston types. This system is considered preferable because the total pumping capacity for normal operation of all presses can be reduced to approximately 50 percent of the total required if individually loaded bottles are used.

Pumps are started by a decrease in water bottle levels which acuate a mercury switch at a predetermined point. Pumps are stopped as the level increases to the second predetermined point. Switches are staggered to acuate the proper number of pumps to meet the load demand. Gage used is specifically designed and adapted for accumulator bottle control and is suitable for direct calibration of a 300-inch water column.

BALANCE METER measures the water level directly rather than using the air pressure method. Changes in the water level cause rotation of the ring which in turn closes or opens mercury switches in a sequential operation. Pumps for hydraulic presses are thus automatically controlled.



Vacuum Faceplate Holds Sheet Stock

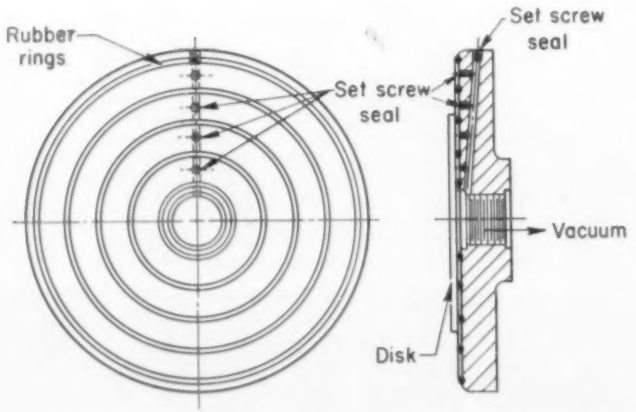


VACUUM FACEPLATE initially did not incorporate a device to insure that it would fail safe. As heavier and thicker sheets were machined, a standard pressure-sensitive switch was installed in the lathe motor circuit to cut off power if pressure should fall below a preset limit. Square workpieces can be held for machining on the lathe as shown. The vacuum pump is a standard unit with free-air capacity of 1.3 cfm and provides up to 27 inches of vacuum.

THIS VACUUM FACEPLATE was developed to meet the need for a device that would hold sheet stock of various thicknesses for turning, facing and counterboring. The device avoids laborious methods of clamping and jig-making when machining thin stock. Developed by the Research Services Div., Air Force Cambridge Research Center, ARDC, Cambridge, Mass., the faceplate maintains accuracy of machined surfaces to within 0.001 inch. The unit comprises three components: vacuum pump and motor, a rotary joint and the faceplate.

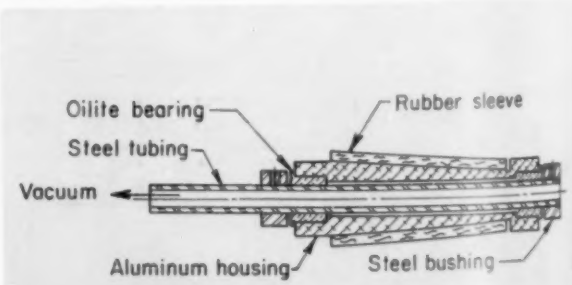
Operation of the faceplate is simple. A disk is held against the plate and a vacuum is drawn behind the disk. Assuming the efficiency of the device to be 75 percent, a 6-inch disk is held with a force of 300 lb. As disk area increases, the holding force increases.

The faceplate is used by itself to hold sheets $\frac{3}{8}$ inch thick or less. Materials as thin as 0.005 inch are held by using a flat disk for backup. Six to eight $\frac{1}{4}$-inch holes are drilled per square inch of auxiliary disk area to expose the workpiece to the vacuum.



FACEPLATE IS MACHINED from a linen-base laminated phenolic plate 2 inches thick. It was bored and threaded to fit the lathe spindle. After mounting on the lathe, the faceplate was turned to finished dimensions, faced and grooved to receive rubber sealing rings. A hole was drilled from the outside to the inside diameters and then sealed at the outer end. Holes connecting the single radial hole were drilled between each pair of sealing rings. Connecting holes are threaded so they can be sealed as necessary to insure vacuum behind the workpiece. The rubber seals are cemented in the grooves.

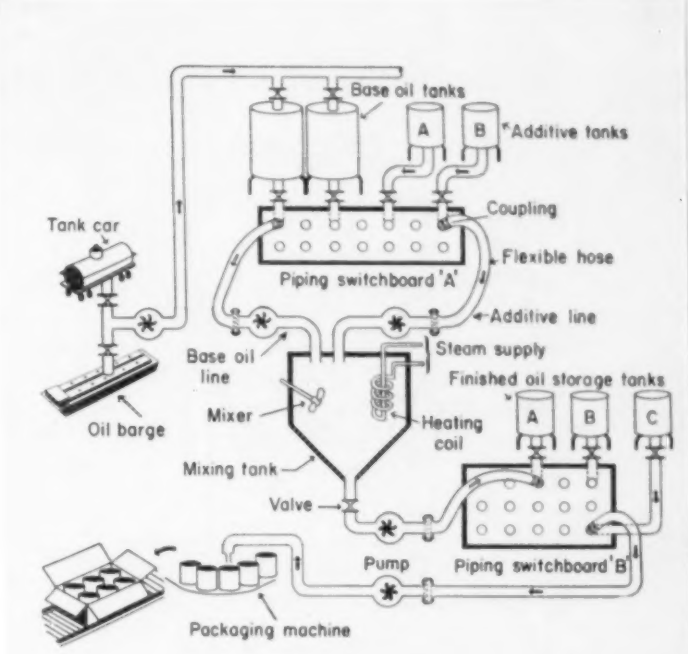
ROTARY JOINT HOUSING is tapered aluminum with a rubber sleeve that insures an air-tight seal at the spindle bore of the standard lathe. Vacuum, induced in the spindle, tends to pull the joint in and tighten the seal. Bearings are pressed into the housing and rotate with it and the spindle. A stationary steel tube runs through the freely rotating housing to connect the vacuum line to the spindle bore. The bearings were reamed in line so the tubing has a sliding fit. Efficiency of the vacuum depends on the bearing-to-tubing fit but no trouble has been experienced from this source.



Viscous Liquids Blended Through Switchboard

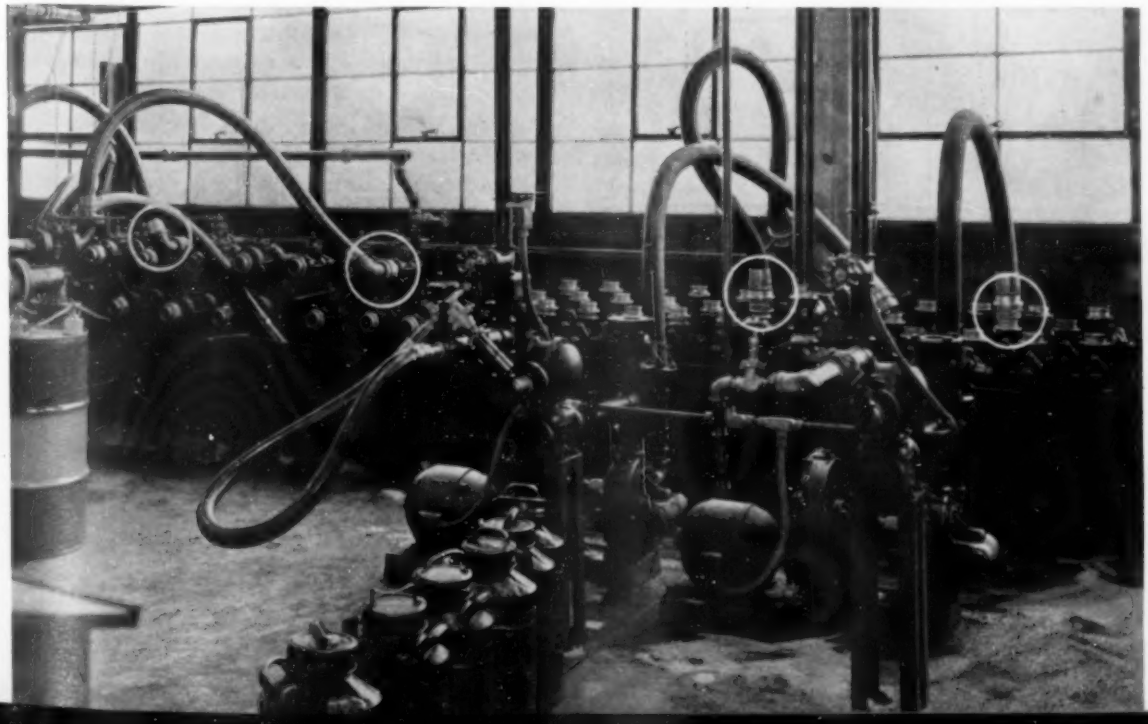
BLENDING OF VISCOUS FLUIDS is accomplished with simplicity and in a novel manner at the Gordon Lubricating Co., McKees Rock, Pa. The only manual operation in the system is in changing flexible hose connections to direct the flow of base and mixed fluids. All manipulation can be handled from the two "switchboards," which are located next to each other.

Blending and packaging are done independently of each other to meet plant operation schedules and market demands. Warehouse charges for packaged products are avoided by storing in bulk until needed.



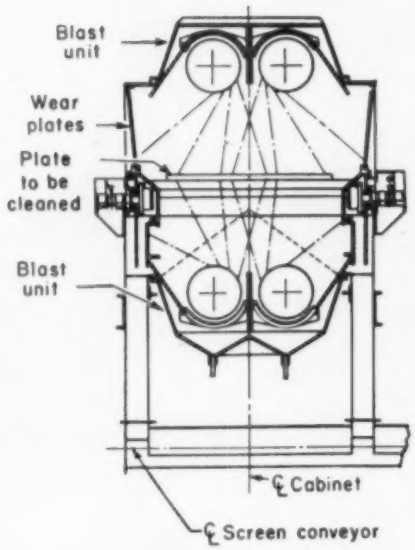
FLOW CHART shows flexibility of equipment for blending and packaging viscous liquids. Base oils and additives are received by tank car and barge, and piped to storage tanks. Desired base oils and additives are piped to mixing tank through switchboard A. Blended mixture is pumped to correct storage tank through switchboard B. Blended product is withdrawn from storage tank and delivered to packaging equipment, whenever desired, through switchboard B.

FLUID SWITCHBOARDS operate in a manner similar to telephone switchboards. Switchboard A is at left; B is at right. Pipe ends from storage and mixing tanks are grouped and correct pumping circuits are made with flexible hose sections. Quick-seal couplings made by Titeflex, Inc., Springfield, Mass., permit changing hoses in seconds compared to the 5 to 10 minutes per coupling required for threaded couplings formerly used. No tools are required with these couplings and pipe ends can be positioned close together. Couplings have full-swivel action so hoses will not kink.

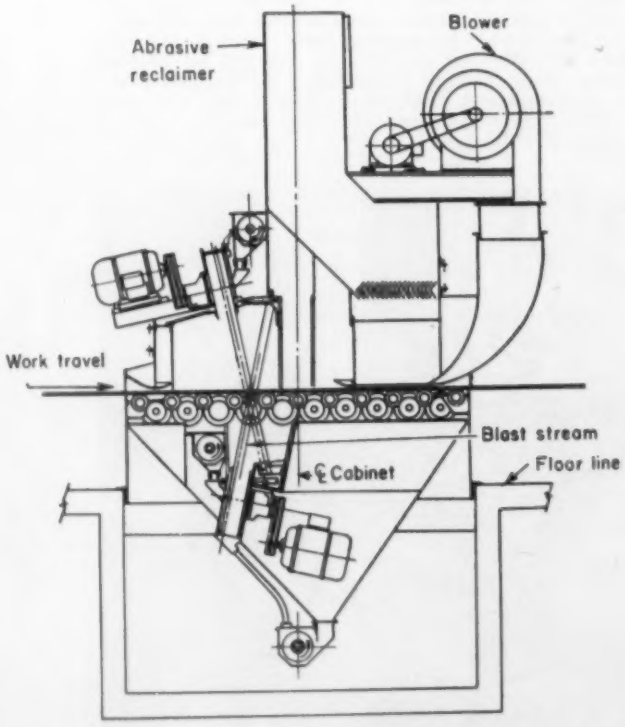


Sheet Cleaning Machine

Blasts Both Sides Simultaneously



Application of Blast



DESIGNED to meet the requirements of manufacturers who need sheet or plate that is clean on both sides, this machine reduces production costs. Hot-rolled steel, blasted clean, can be used instead of cold-rolled or pickled steel. Designed and built by Pangborn Corp., Hagerstown, Md., it cleans both sides of sheet or plate simultaneously in widths to 60 inches at cleaning rates of 60 to 100 sq ft per side per minute.

The machine has four abrasive blast wheels with a capacity of 132,000 lb of abrasive per hour. The machine automatically takes steel sheet or plate into the blast chamber, blasts top and bottom surfaces, removes abrasive from the sheet and discharges the clean sheet. Since the abrasive streams from above and below hit the steel at the same point, there is little chance of warping the sheet.

BLAST WHEELS are set so that the abrasive streams strike the workpiece surfaces at an angle of 78 deg. This angular impact provides fast cleaning and makes the abrasive bounce from the point of impact so the continuing abrasive stream strikes the sheet rather than spent abrasive. Spent abrasive is blown off the sheet as it moves past the fan tunnel. It drops into a hopper and is then raised to the separator by an elevator.

A feature contributing to minimum maintenance is the arrangement of idler rolls on the work conveyor. Rubber-covered rolls, which carry the sheets through the blasting machine, do not drive and can easily be lifted out and replaced through access doors. The machine is 15 ft high, 18 ft wide and 20 ft long.

SAFETY CONTROL

for a cycling press

By Jay Retsema*

Tool Engineering Supervisor
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John Wood Co.
Muskegon, Mich.

PRODUCTION PARTS frequently require the design of tools for presses that cannot be safely used with existing guarding equipment. When such a situation exists, there are usually two alternatives: devise means for guarding the operator and equipment, or do the operation in another way so that existing guards will give satisfactory protection. If the tooling will operate efficiently as designed, it is usually better to make new guarding devices.

Typical of such a situation is the production setup required for the part shown in *Fig.* 1. The welded steel tube is first squarely cut to length and is then formed simultaneously on both ends in a press. A forming die set was designed for an open-back inclinable press used in an upright position. Since the press stroke was short, it was necessary to retract the die from beneath the ram for loading and unloading.

A die set, *Fig.* 2, was designed that would produce satisfactory parts and that could be moved for loading and unloading. The punch was attached to the ram and the die was positioned on the bolster so it could be moved toward the front. Movement of the die is controlled by front and rear stops, and is achieved manually with the handle provided for that purpose.

Initially, the cycle was outlined as: (1) operator pulls die toward front of press and inserts part, (2) operator pushes die to rear stop and trips press, (3) press completes forming operations and (4) operator pulls die forward and unloads it.

Such a production cycle was good but no provision could be made for protecting the operator, the press or the die set with existing guards. With a trip-actuated cycling press, it is imperative that the die always be in alignment with the punch when the press is cycled because nothing but a smashup can alter the machine cycle once it starts. None of the

*Senior member ASTE Muskegon chapter.

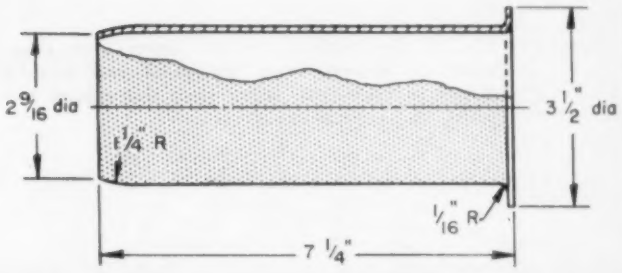
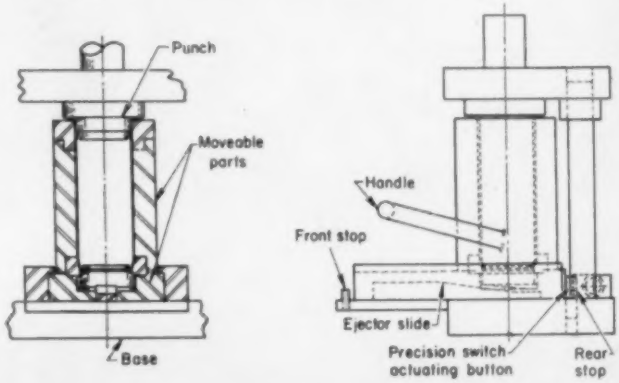


Fig. 1. Eighteen-gage steel cylinders, 2¾ inches in diameter and 7⅝ inches long, are flanged at one end and compressed at the other, as shown, in one press operation.

Fig. 2. Because press stroke was short, the die had to be designed so it could be retracted for loading. The ejector slide causes the formed part to rise out of the die as the die is pulled forward.



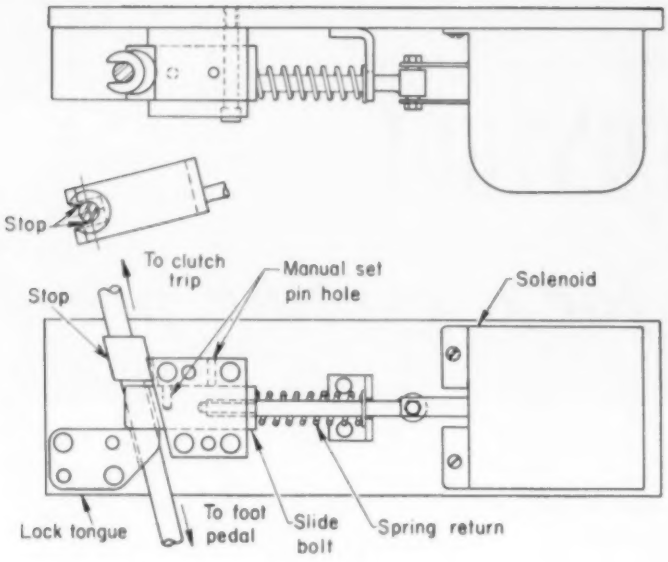
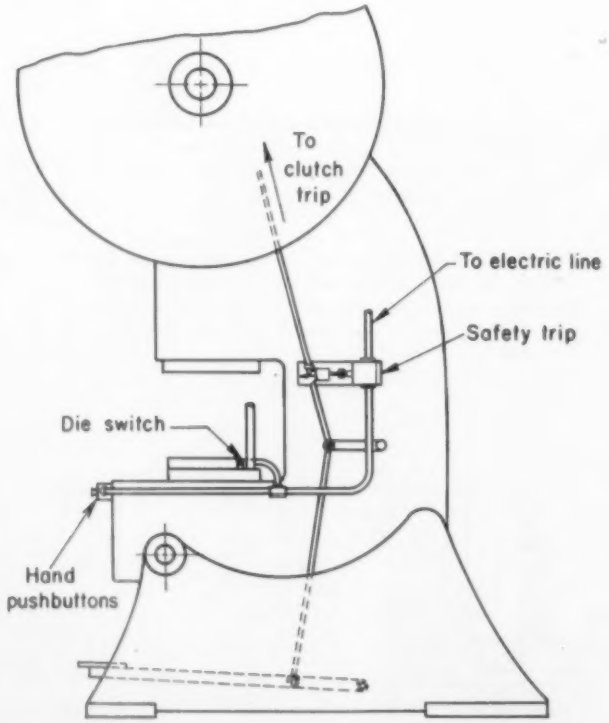


Fig. 3. Locking mechanism is shown in the off or safety position. When the die is properly seated and the operator depresses two push-buttons, the solenoid retracts the latch and the press clutch can be tripped.

available guarding equipment could be used to satisfactorily protect the operator, press and die set.

Since the tooling would operate efficiently, a decision was made to devise a guard system that would effectively protect all three elements. Such a system was to be made with a minimum of change in the tools.

Fig. 4. Components for the safety system are permanently mounted on the press and have found utility in operations other than the specific one for which the system was designed.



To protect the operator from injury, and the press and die set from damage requires only that the operator be out of the way and that the press be prevented from operating if the die is out of line. Basic unit of the protective system developed is a lock, *Fig.* 3, that prevents tripping of the press unless the die is correctly positioned and the operator's hands are out of the working area. The lock is cleared by a pull type solenoid that can be energized only if the die is correctly seated, closing a precision switch, and the operator is pressing two widely separated pushbuttons to complete an electrical circuit, *Fig.* 4. The press is tripped by a foot pedal.

The lock has a U bolt and tongue, *Fig.* 3, with the bolt moving freely in the tongue block. The bolt can be moved by the solenoid or can be held inoperative by inserting a pin in the set pin holes. Manual set is used when the press is used in production of conventional parts. A stop ring is welded to the trip rod so it just clears the lock bolt when in an idle position. When the bolt is home, the stop will hit it and the trip rod cannot be moved.

The lock bolt and tongue block were made with ample proportions so misuse by the operator would have no effect on the protective qualities of the mechanism. The system will fail safe because any breakage resulting from misuse will occur below the lock or trip catch.

This protective system has worked successfully for two years on this and other operations, such as a shaving operation where the part is placed in a tray and slid into the die. For conventional forming operations, the two pushbuttons are used to insure that the operator's hands are outside the die area. It is anticipated that the same basic system will also be used when it is necessary to accurately locate a part in a die before cycling the press. For such use, several precision switches will have to be actuated by the part before the press can be triggered.

how to determine

assembly tolerances

By Martin H. Saltz

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Hughes Aircraft Co.
Culver City, Calif.

IN MANY SHOPS, tolerances on components of assemblies are assigned on a tight-as-possible basis. This is done to assure proper functioning of the assembly. Although this approach assures parts that will function, actually they are obtained at undue expense in production time and operating cost. By employing the statistical considerations of quality controls, it is possible to determine tolerances on a more exact basis so that, by contrast, they will be as loose as possible and still satisfy the specifications. Thus, when tolerances are assigned, based on a statistical analysis, they permit more efficient and cheaper production.

To take advantage of this quality control method it is first necessary for the process or processes producing the parts to be in statistical control. One of the tools commonly used for this purpose is the sensitive $\bar{X}$ and R chart, though there are others adapted to specific conditions, THE TOOL ENGINEER, Feb. '54, p. 49. If it is determined that the processes producing certain parts are in statistical control, further statistical analysis can be applied to facilitate assignment of tolerances to parts being assembled, *Fig.* 1, or mated together in some way.

The method can be readily understood by considering as an example a simple assembly consisting of three rods being placed end to end, *Fig.* 2. Rod A is 1 inch long $\pm$ 0.25 inch; rod B is 2 inches long $\pm$ 0.25 inch and rod C is 3 inches long $\pm$ 0.25 inch. By assembling the smallest of parts A, B and C, the resulting assembly's total length would be 5.25 inches. If, however, the longest of parts A, B and C are assembled, the length of this assembly would be 6.75 inches. Superficially it would seem that the tolerance of the assembly, *Fig.* 2, should be 6 inches $\pm$ 0.75 inch. This approach to tolerances assumes that the minimum of each part will always mate with the minimum of the other

Fig. 1. Test of a section of a wave guide to determine losses. Since the section is made up of several smaller components, loss in individual parts is handled in the same manner as tolerance of a mechanical part. The statistical quality control methods described are used to determine assembly and part tolerances.

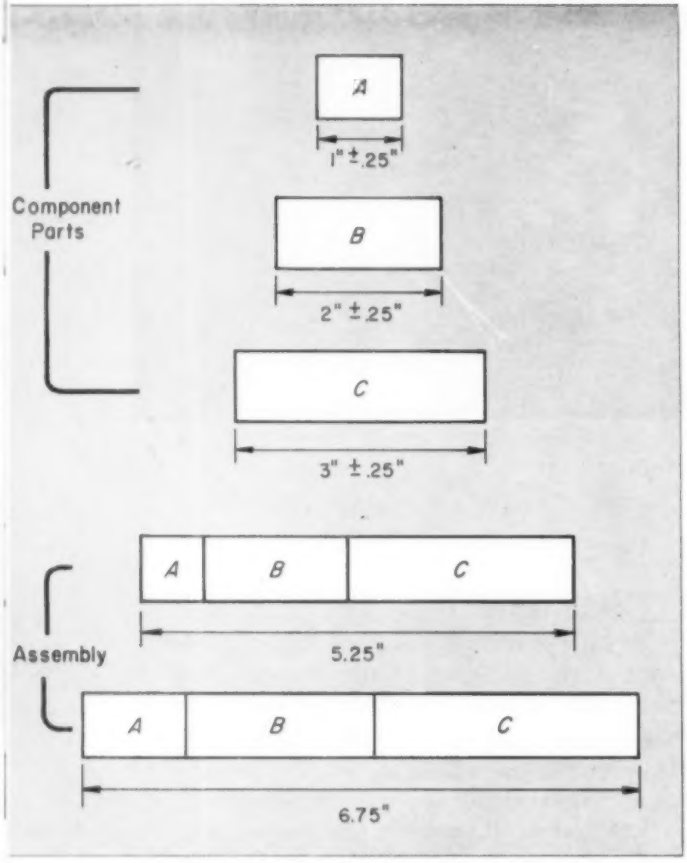


Fig. 2. Example of assigning of part and assembly tolerances by conventional methods. Resulting assemblies represent minimum and maximum extremes.

components, similarly, that the maximum will always be mated with the maximum of the other components. Many firms follow this type of reasoning in assigning tolerances to assemblies.

In the example just cited, if the desired length of the over-all assembly were 6 inches ± 0.75 inch and the tolerance of each component were to be equal, under present procedures, tolerances of ± 0.25 inch would be assigned to each of the components. As will be seen shortly, the 0.25 inch is over-severe if one is willing to accept a 0.75-inch over-all tolerance in the assembly.

If parts are taken from a process in statistical control, which is producing part *A*, *Fig.* 2, and these parts are grouped according to their length, the resulting histogram can be represented by a smooth curve, shown in *Fig.* 3. The nominal value would be 1 inch and the natural tolerances would be ± 0.25 inch. Of the parts produced by this process 99.7 percent would fall within plus or minus 3 sigma (σ) or a total spread of 6 sigma, where sigma is a measure of the spread of a distribution and is equal to the root mean square deviation of the measured values from the average. Then 1 sigma for this process, if it were producing parts as desired, would be 0.5 inch divided by 6 and equal to 0.083 inch. Similarly, sigma for parts *B* and *C* would be equal to 0.083 inch.

It can be shown that sigma for the assembly (σ_T) would be equal to:

$$\begin{aligned}\sigma_T &= \sqrt{s_a^2 + s_b^2 + s_c^2} \\ &= \sqrt{(0.083)^2 + (0.083)^2 + (0.083)^2} \\ &= 0.083\sqrt{3} \\ &= 0.144 \text{ inch}\end{aligned}$$

and 6 sigma for the assembly would be equal to 0.864 inch.

By applying statistical techniques to the tolerances of individual parts, it can be seen that the tolerances on the completed assembly are ± 0.432 inch, instead of ± 0.75 inch as previously assumed.

The above equation can also be written so that instead of working with sigma, the tolerance of the component can be used directly. The equation then becomes:

$$T_t = \sqrt{T_a^2 + T_b^2 + T_c^2}$$

where:

T_a is the total tolerance of part *A*
T_b is the total tolerance of part *B*
T_c is the total tolerance of part *C*
T_t is the total tolerance of the assembly

By either method of calculation the result is the same and indicates that the assembly is actually being held closer than necessary.

In practice, it is usually desired to determine the tolerances to be applied to components so that the resulting assembly tolerances will be within a particular value. This, in effect, is the reverse of the procedure just demonstrated.

The procedure then is as follows: based on the same assembly, it is assumed that the desired over-all length is to be 6 inches ± 0.75 inch. The question is: what tolerance should be assigned to the individual component values so that the requirement on the assembly will be met? This problem is depicted in *Fig.* 4 where the length of the assembly is specified and the tolerances which should be assigned to the components must be determined. If these tolerances were assigned on a visual basis the answer to the problem would be that each part should be held to ± 0.25 inch. Solving the same problem by statistical methods will demonstrate that a saving can be realized.

It can be reasonably assumed that the tolerances of the individual parts are the same, therefore the sigma value for the assembly is 1.50/6 which should be equal to:

$$\sigma_T = \sqrt{s_a^2 + s_b^2 + s_c^2}$$

Solving for $s_a + s_b + s_c$ the result is 0.144 inch; therefore, the tolerance on each component of the assembly is equal to ± 3 x 0.144 = ± 0.432 inch. If the tolerances, and therefore sigma for each component are the same, this equation simplifies to:

$$\sigma_T = \sigma\sqrt{3}^{*} = 1.73\sigma$$

$1.73\sigma = 0.25''$

$\sigma = 0.144''$

$3\sigma = 0.432''$

It can be seen that, based on the statistical method, the tolerances assigned to individual components in order to obtain a known tolerance in the assembly, are looser than they would be if the tolerances were assigned in the conventional non-statistical way.

In practice this would mean that the production department would have less difficulty in maintaining parts specifications with statistically determined tolerances. Therefore, the assembly would be produced at lower cost. Tolerance values used in this fictitious example are, of course, of greater magnitude than those usually encountered in the shop. This was done intentionally so that the calculations would be somewhat simplified and results more easily visualized.

Although the text has been restricted to the lengths of components of assemblies, the same procedure can be applied to other characteristics that are being added or subtracted in any combination. This would include resistance in series, weights or any other characteristics. Thus the assembly can be composed of more or less than three components.

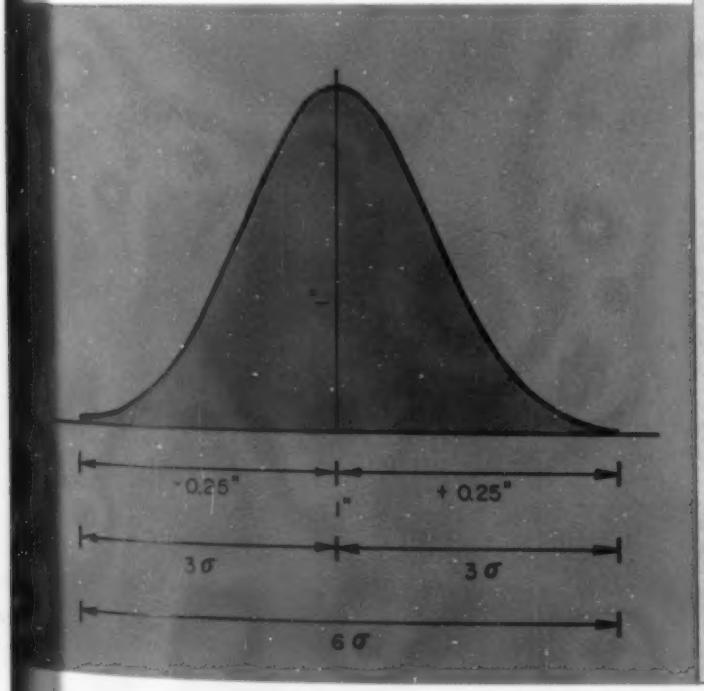
In the discussion so far, it has been assumed that the length of each component was independent of the other lengths, in other words that each part was made by a different process, although all were assumed to be in statistical control. Sometimes, of course, the characteristics which are to be added together are not independent of each other. A simple example is an assembly consisting of three rods of equal length being produced on the same machine and the process is not in statistical control. In such a case, the three components that will be assembled into one unit are all part of the same distribution. In such an event, instead of applying the statistical approach as discussed, the tolerance should be assigned mathematically. Therefore, the tolerance for each component would be $\frac{1}{3}$ the tolerance desired on the complete assembly.

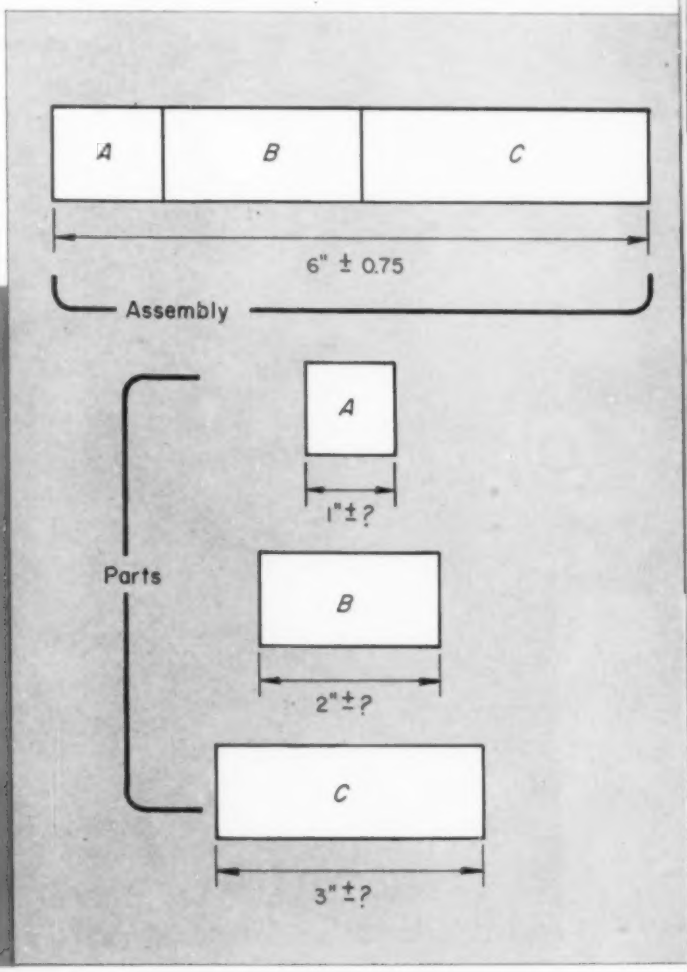
In any of these instances, however, it is evident that when statistical quality control methods are used, the tolerance determined for an assembly is actually less than the sum of the tolerances for the component parts and therefore more relaxed than normally expected.

*This factor will vary with the number of components making up the assembly: $\sqrt{3}$ for three components; $\sqrt{2}$ for two, etc.

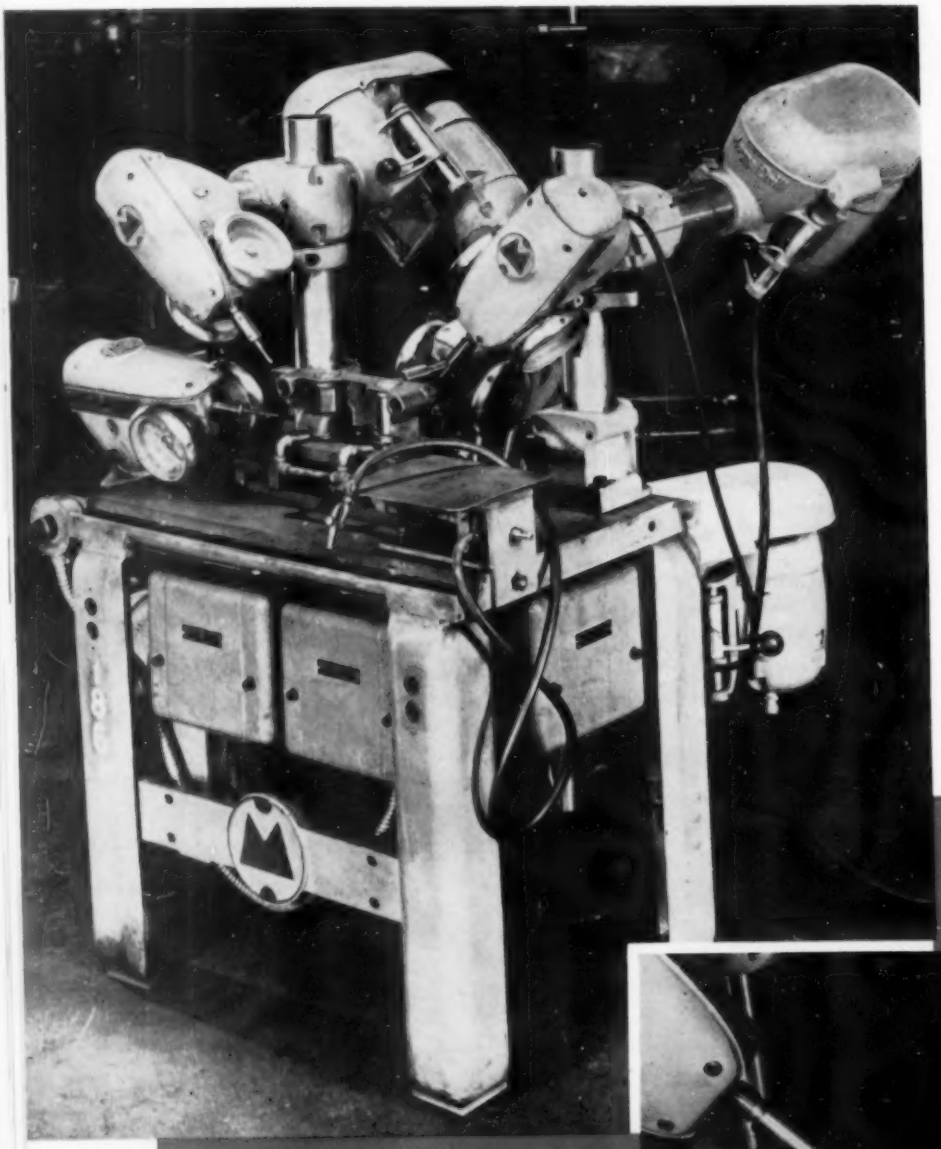
Fig. 3. (below) Distribution of parts produced to a specification of 1 inch ± 0.25. As indicated, the total tolerance is equal to 6σ.

Fig. 4. (right) Example of practical situation where the over-all assembly dimension is usually given with the required over-all tolerances. The problem then is to compute tolerances of individual components to meet the requirements of the assembly.





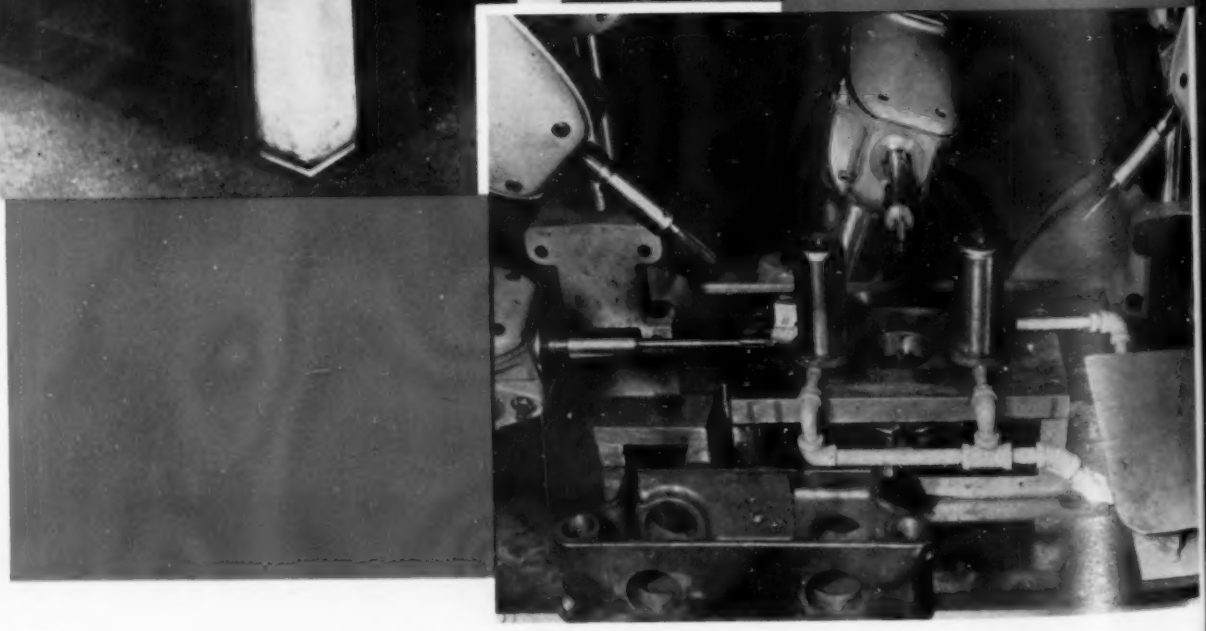
TOOLS at work

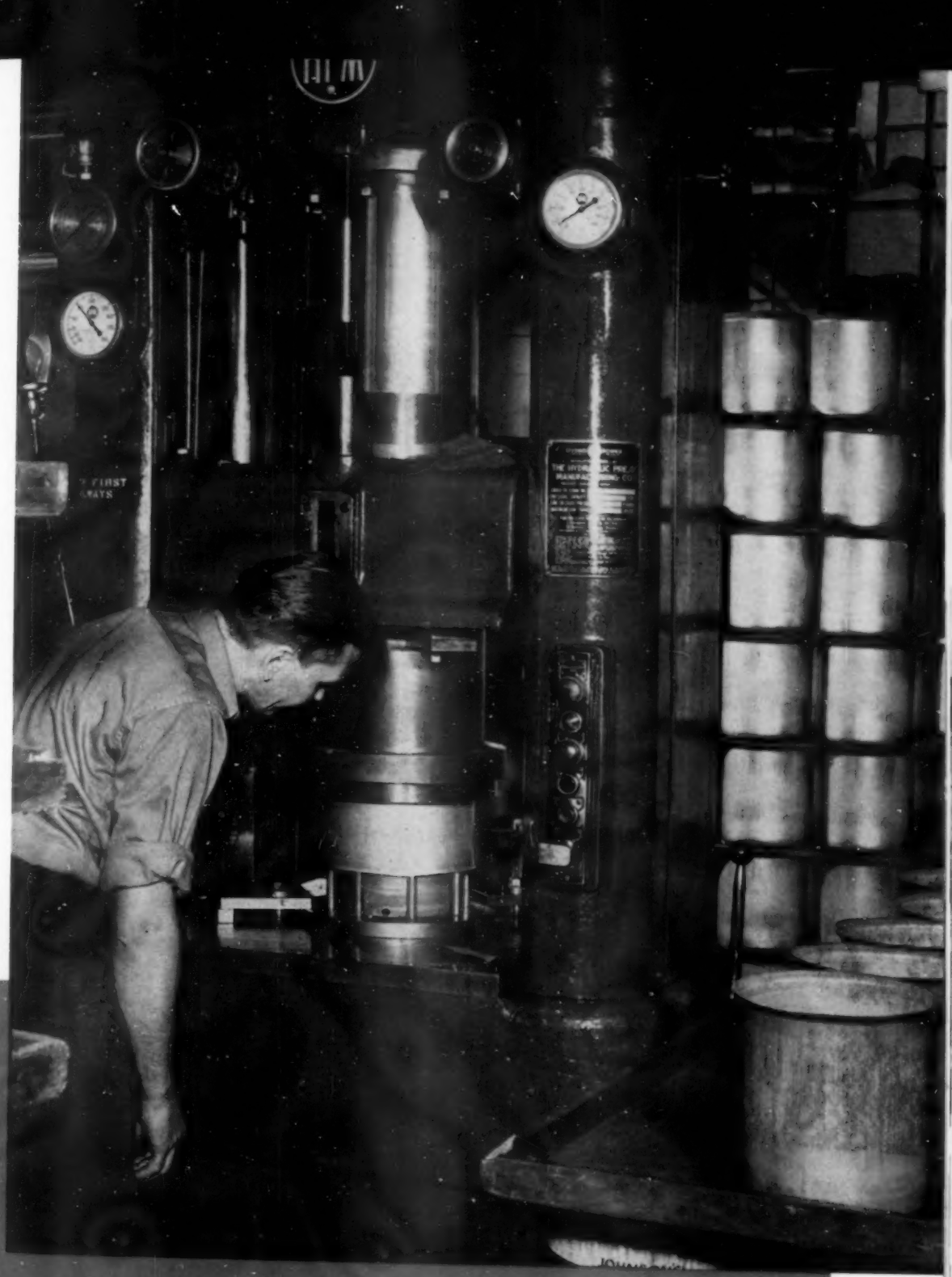


TAPPING of five holes simultaneously is accomplished with this special machine built with standard components for use in a low-production shop. The installation produces 120 parts per hour against 30 previously. Saving per part amounts to 11 cents. Setup time was minimized and fixed costs held down by simplicity of tooling, shown in close-up view below.

Fixture design is sturdy, yet uncomplicated, thereby reducing handling time. Workpiece shown in foreground is grey iron casting, calling for tapped holes from five different angles.

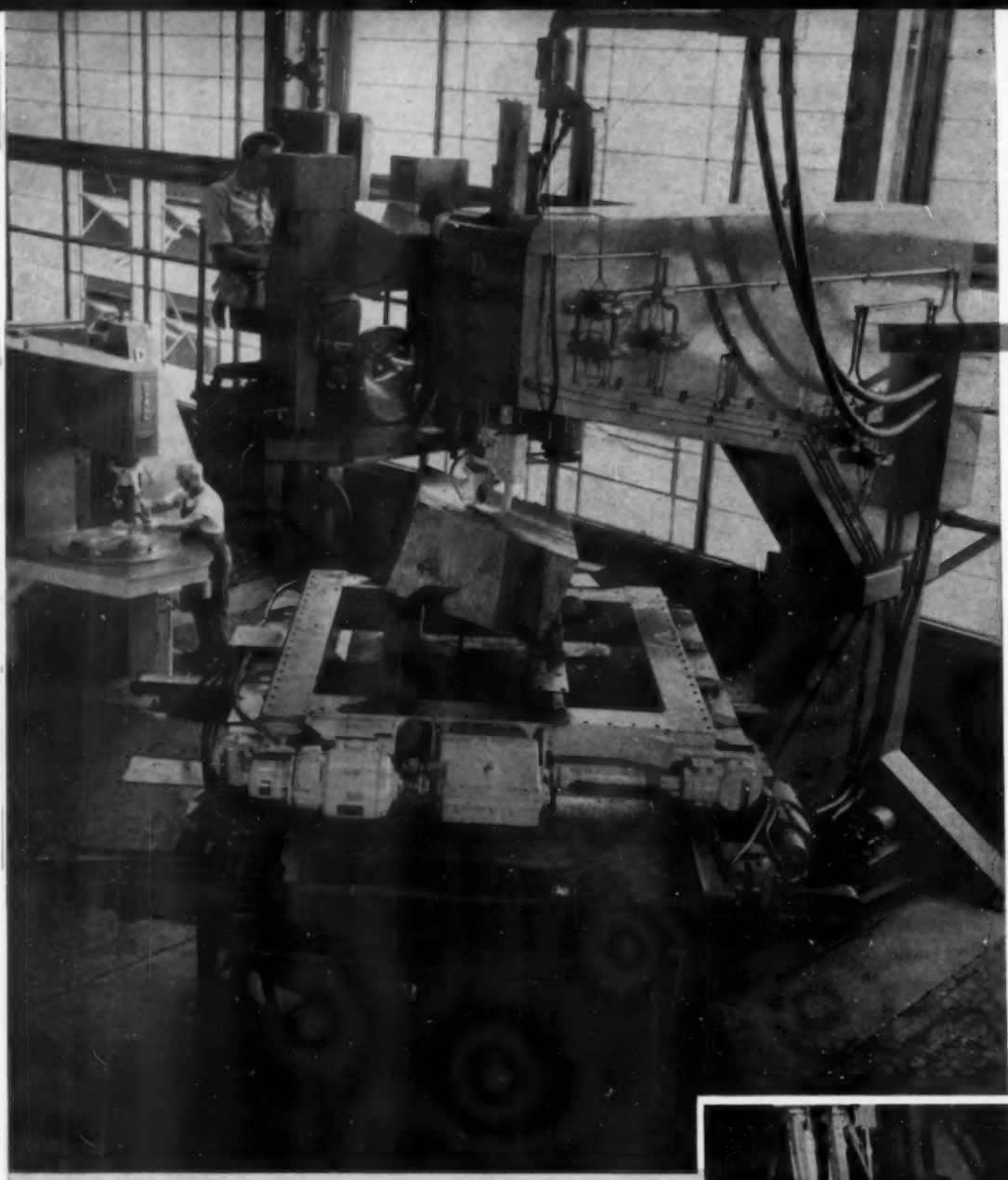
—Photos courtesy Magna Engineering Corp.





THREE-STAGE deep draw is performed on 100-ton hydraulic press at Rao Mfg. Co., Minneapolis, Minn. Blank is 20¼-inch diameter, 0.016-inch aluminum. The difficult operation is achieved by pre-coating the blank with drawing wax. Application is made with paint roller.

—Photo courtesy S. C. Johnson & Sons, Inc.

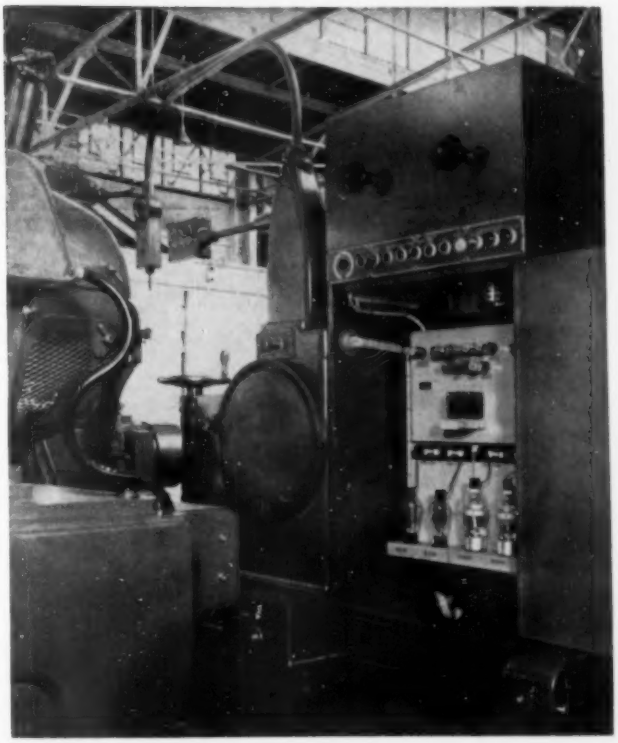


REMOTE CONTROL band saw (above), with triple-tired table, machines intricate die openings for large extrusion dies for the Air Force heavy press program. An air jet removes chips from layout line at the top of workpiece. A recirculating coolant further aids in chip removal, provides finer finish and lubricates the saw band. The worktable can feed the work through 360 deg at a speed up to 32 ipm.

Electric and hydraulic power for operation is controlled and guided by the sawyer from the control station suspended over the machining area. The sawyer observes the cutting action through viewer having a periscope-like arrangement of mirrors. He pilots the work through the blade by turning the wheel. To move the work into the blade he pushes the wheel forward; to retract it he pulls the wheel toward him. An indicating control system of strain gages provides sense of feel. Automatic safety checks preclude excessive cutting and feeding forces. *—Photos courtesy DoAll Co.*

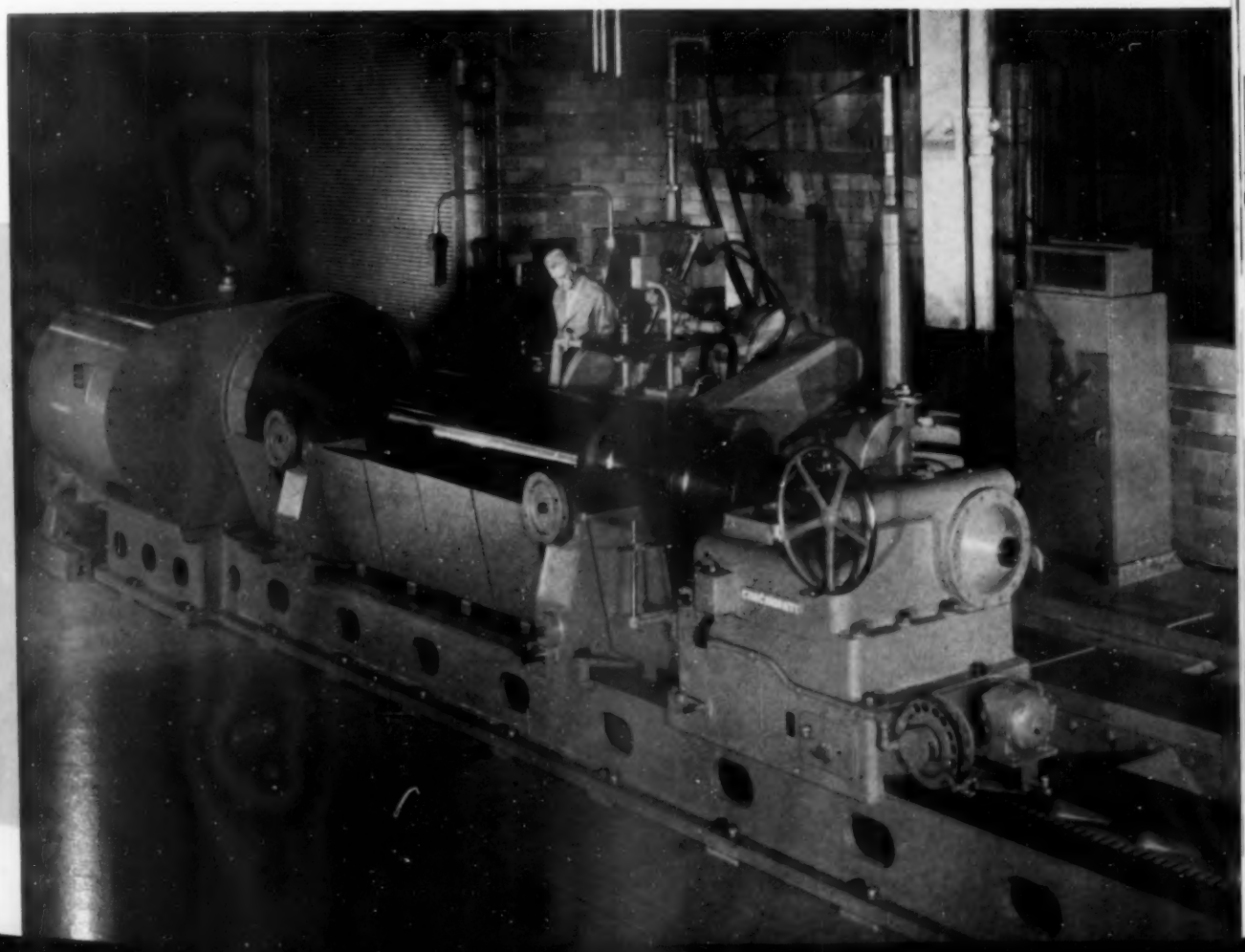
TOOLS at work

—Photos courtesy Cincinnati Milling Machine Co.



GRINDING operation (below) is performed on 10-ton hot mill backup roll. Because hardness of roll is 50 Rockwell, setup is exceptionally rigid. Vibration and backlash are reduced through variable speed reversing electric motor drive. Rough grinding feed is about 30 ipm. Headstock runs at 15 rpm and stock removal averages 0.0005 inch on the 27-inch diameter of the roll. Surface finish is in order of 2 microinch rms.

Electronic control panel of machine carriage is shown in the close-up. Tubes in the panel convert ac to dc to furnish variable power to the drive and permit quick and accurate reversal with traverse rates up to 75 ipm.



Arc Welder Installation

designed for large tanks

By W. W. Weber

Welding Engineer
The Pfaudler Co.
Rochester, N. Y.

TO WELD cylindrical tanks in a wide range of sizes, a special arc welding installation has been designed and built, *Fig.* 1. Tanks of carbon steel are fabricated largely by automatic submerged arc welding because the work is done rapidly and welds of maximum penetration are secured. While the new machine can handle both longitudinal and girth welds, it was designed for the more difficult internal and external girth welds.

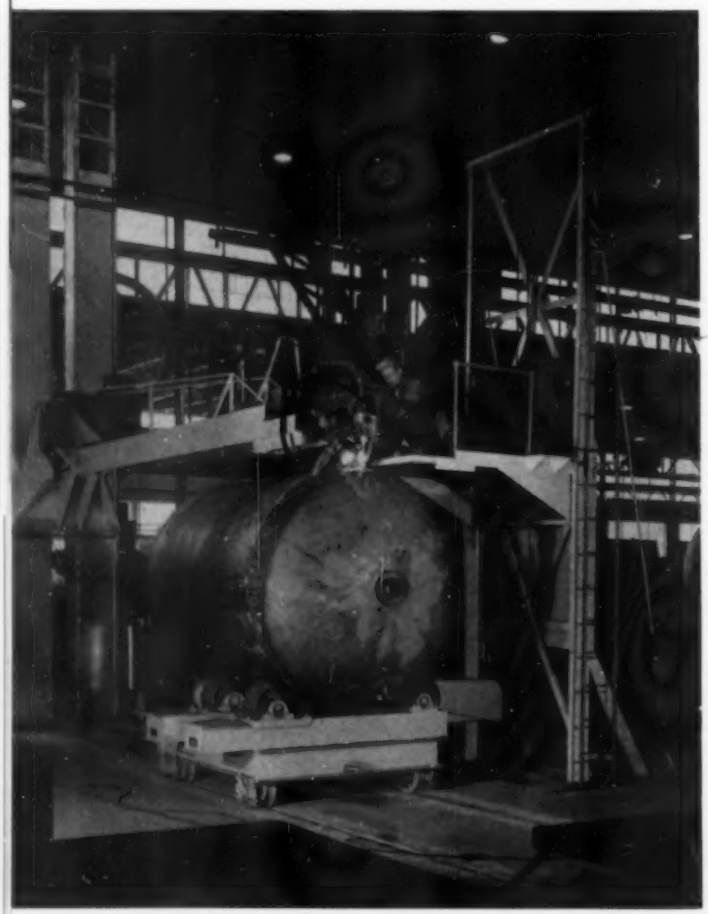


Fig. 1. Setup for making automatic arc welds on tanks, using a 24-foot boom, adjustable for height, to support the welder head and auxiliary equipment. For external welds, the operator sits on a special scaffold.

To make the girth welds on large tanks a long boom is used to hold the welding head and a scaffold is provided for the operator. The boom and scaffold are adjustable vertically. The tanks are supported on variable speed turn rolls for both external and internal welds. The boom is supported by a double column, which is more rigid than in previous machines as well as more compact. This column, which is 29½ feet long, is bolted to the floor and its upper end is bolted to the building structure.

The column components and the boom are weldments of box section. Side members of the columns are 15 x 3½-inch channels and those of the boom are 12 x 3-inch channels. The boom channels are 20½ feet long and are stiffened vertically by two 1-inch bars that form a truss above the box boom proper. At its outer end, the boom has an extension, *Figs.* 2 and 3, with a longitudinal screw adjustment. This extension supports an LAF-2 Lincoln Electric Co. welding head, *Fig.* 2. With the extension, a total length of 24 feet from the face of the column to the electrode is attained.

A spreader bottom plate is welded inside the boom channels whose flanges face inward, but the top plates of the boom are bolted on to afford access to the interior which contains the power cable. At the inner end the boom channels are welded to the vertical carriage or shoe, *Fig.* 1, which includes a ⅜-inch plate 68 inches high and 59¾ inches wide, stiffened by gusset plates welded on front and back to form a rigid structure. Wheels, supported by brackets at the lower outside corners of this carriage

ride on the inner faces of the column channels. The wheels of the carriage bear on track bars welded to the back faces of the columns. Welded to the columns just outside the bars are vertical racks 2 inches wide, *Fig.* 4. The boom is raised or lowered by means of meshing pinions driven by an electric motor through a gear reducer. Wide spacing of the wheels helps to provide excellent transverse and vertical rigidity.

Inside the columns are counterweights suspended by cables that run over sheaves at the top of the columns and down to anchorages on the vertical carriage, thus balancing the boom assembly vertically. A safety feature is a pair of locking levers, each of which has a tooth at one end that engages one of the racks and is held in by a spring. Operating on the other end of each locking lever is a solenoid that disengages the lock only when the driving motor operates, the solenoid coils being in series with the motor. Thus, the boom can be raised and lowered only when the motor and solenoids are energized.

Below the boom and parallel to it are floor tracks for a carriage with variable speed turning rolls. The tank to be welded is mounted on this carriage. Tracks extend into an aisle and beyond the end of the boom, where loading of the tanks is done by a traveling overhead crane. After loading, the carriage is moved under the boom until the welding head electrode comes over the joint where the weld is to be made. There are the usual fine adjustments for positioning the electrode that are normally provided with such heads.

For girth welds, the welding speed is controlled by a variable rheostat. This control, normally mounted on the turning roll carriage, has been transferred to the boom so that the operator at the head can adjust the speed without leaving his station. For external welds, the operator sits on a scaffold platform that is adjustable for height in its supporting frame, *Fig.* 1.

Although the setup was planned chiefly for internal girth welds, as in *Fig.* 3, external welds can readily be made. In making internal welds, the operator can kneel or stand on the tank wall or can ride the boom, as the latter has ample strength to support his weight. Besides girth welds, the machine

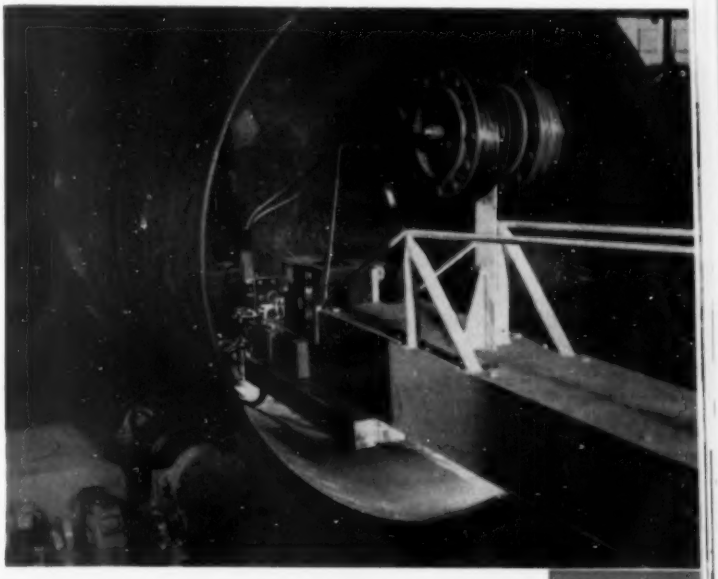


Fig. 2. (below) Close-up of the head, along with control units, supported on an adjustable extension of the boom. Power cable and vacuum hose for picking up unfused flux, extend through the hollow boom.

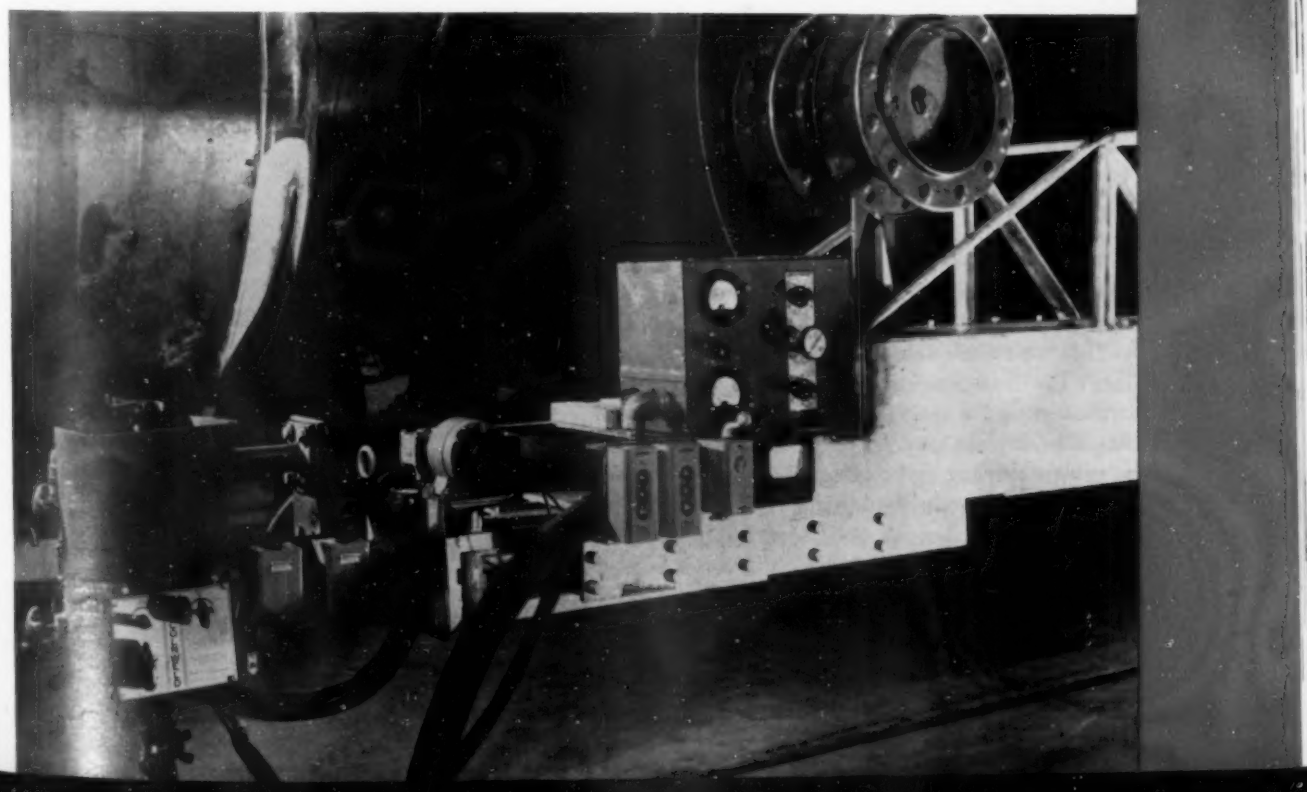
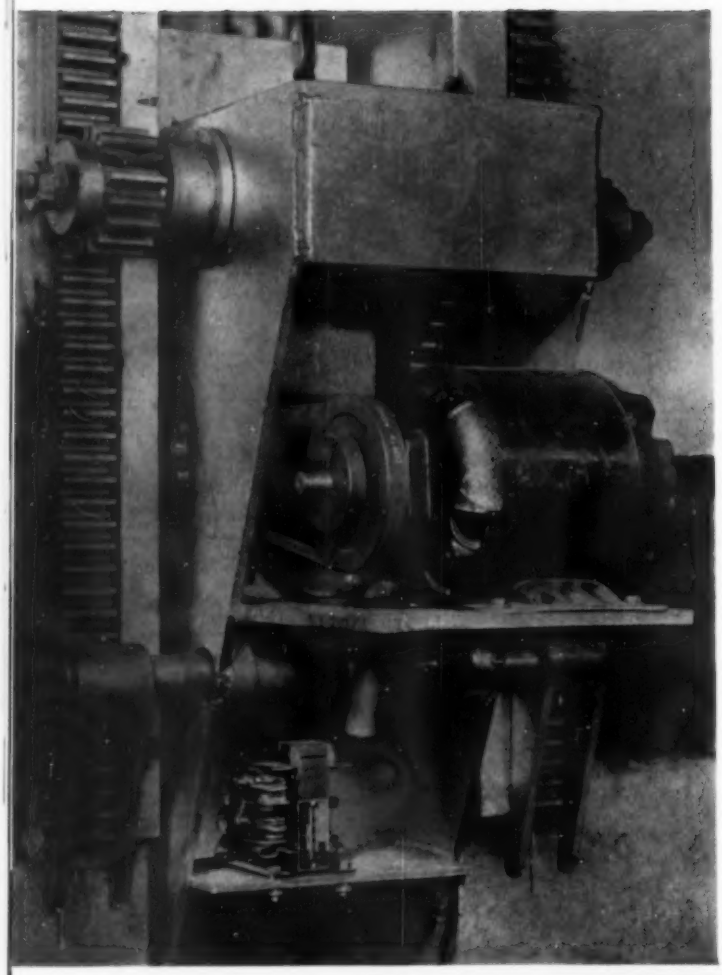


Fig. 3. (right) Boom extension set up for welding inside a tank shell. Controls include those for welding and for adjusting the speed of tank rotation.



can also make longitudinal welds, if required, by using the carriage to move the tank longitudinally without rotation while the welding head remains fixed. Ordinarily, however, longitudinal welds are made on another machine in the area where shells are formed by rolls.

On the automatic head is the usual flux hopper from which welding flux is fed automatically. Flux that is not fused in welding is picked up by a vacuum system whose tanks and blower are mounted on the inner end of the boom as shown in *Fig.* 1. This system cleans the recovered flux and returns it to the head hopper along with the make-up supply of new flux. In general, a helper uses the vacuum hose to pick up unfused flux and also chips off flux that adheres to the weld. The mild steel flux used, however, is almost self-cleaning.

Near the outer end of the boom is a support for two reels, *Fig.* 3, of mild steel welding wire that is fed automatically by the head. Welding current is supplied by two 900-amp d-c generators mounted on a floor stand next to the column.

Welding speeds up to 35 inches per minute are readily attained and the high current density insures excellent penetration. Welds are spot-checked by means of X-ray equipment specially designed for this purpose to maintain high quality.

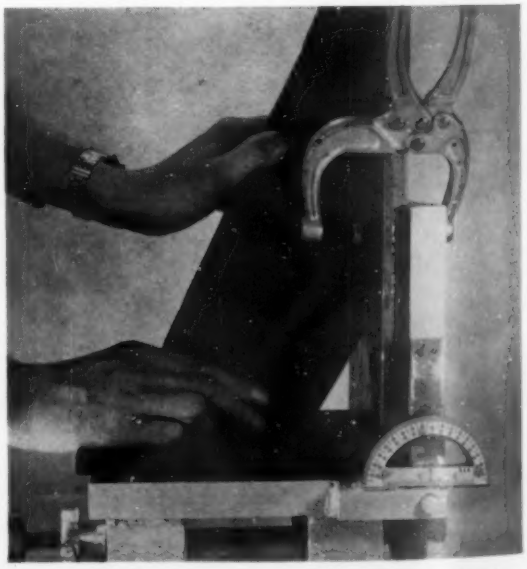
Fig. 4. Rear portion of the carriage showing the motor-driven pinions that engage racks welded to the rear of columns to move the carriage vertically. Levers lock the carriage except when the motor is energized.

Welding Time Saved

WELDERS are saving an estimated average of five manhours per aircraft jig because of the weld and check fixture which simplified positioning and welding of open and closed angles and gussets.

The fixture, devised by jig-builder Woodrow W. Keas at Temco Aircraft Corp., offers multiplied economy since as many as 2,000 angles are used in a single jig. Sides of the angles range up to 22 in. long—almost twice the length of the largest standard stock angle. Angle sides formerly were held together by hand while being tack welded.

This necessitated repeated checking and adjusting. The least inaccuracy in joining angle sides caused excessive machining time. The new fixture has a back plate and a bed plate, hinged together to permit opening and closing adjustment. Turning a single nut tilts the back plate to form any angle from 30 to 180 deg. A second nut locks the plate at the desired angle. Exact degree of angle is positively determined when an indicator, attached on one edge of the back plate, is opposite the desired degree mark on a protractor, on top of hinge.



Angles on welded jigs are inexpensively produced on this weld and check fixture. Back plate is tilted to the desired angle by means of the threaded rod under the bed plate.

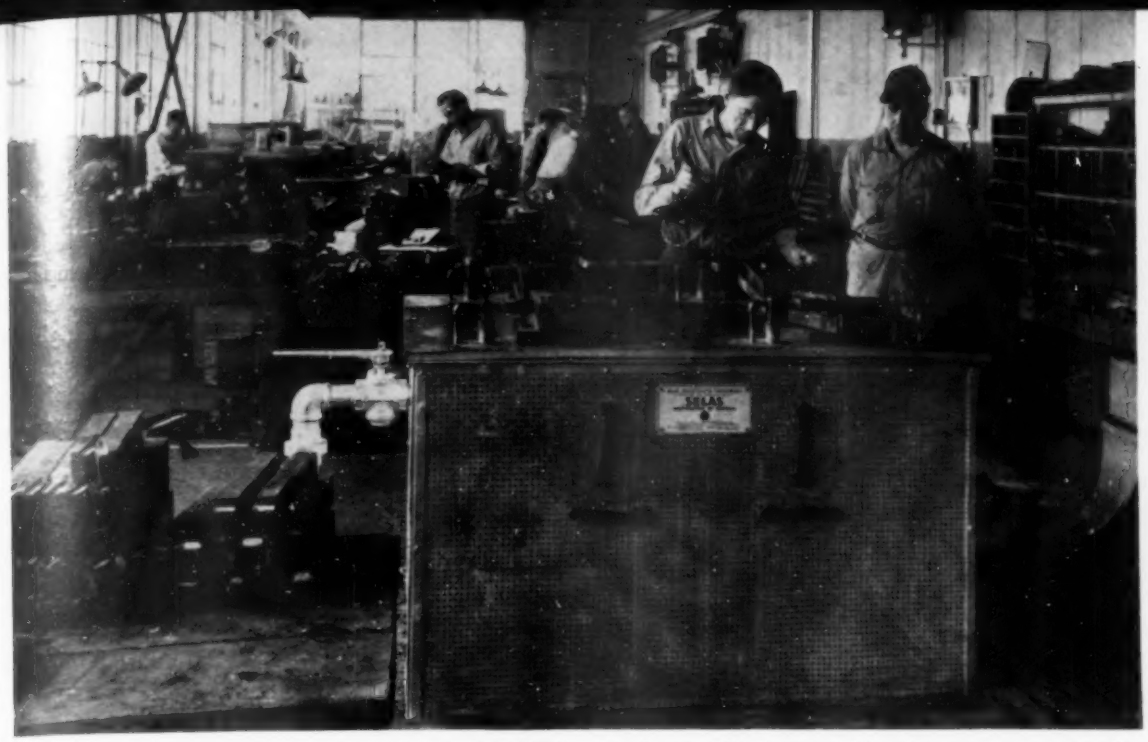


Fig. 1. Production brazing carbide inserts with a four-station gas brazing machine. A one-station machine is also built for low production plants.

carbide tip brazing

with high-speed gas heat

By Charles A. McFadden

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BECAUSE of its low ductility and comparatively high cost complete carbide tools are seldom used. Instead, carbide tips are attached to carbon steel shanks, mechanically or by brazing. About 75 percent of the tools presently in use are brazed.

There are many methods for attaching carbide tips to tool shanks but one of the best is typified by a brazing installation in the central tool department of the Midvale Steel Co., Philadelphia, Pa. This is a high-speed brazing process using gas burners and incorporating operating flexibility.

Carbide tips can be affixed to the shank either mechanically or by brazing. About 75 percent of the tools presently in use are brazed.

Fast-heating air-gas burner machines have been installed in the central tool department of Midvale Steel Co., Philadelphia, Pa., for high-speed brazing of carbide to steel shanks.

A pair of fast-heating burners is installed at each of the four brazing stations on the machine, *Fig.* 1. The heating cycle is automatically controlled by vernier-set electric timers. Any commercial gas (natural, manufactured, propane, etc.) can be burned in the ceramic-lined high-pressure combustion chambers, *Fig.* 2. The ceramic liner acts as a catalyst to speed the combustion reaction and insures that the gas is fully consumed within the combustion chamber. A molded ceramic manifold plate meters the premixed air and fuel gas, and permits a fuel turndown ratio up to 40:1 without backfire or flame blowout. Flexibility in operation is possible because burners can be adjusted in seconds to permit han-

dling tool shanks of different sizes. One set of burners handles a wide range of tool sizes.

Combustion occurs at pressures up to 3 psig and temperatures up to 3000 F. Intensely hot, burned and inert gas leaves the restricted burner nozzle at velocities up to 700 fps. Fast heating of the work is accomplished by rapid transfer of heat from the burned gas-air mixture to the tool shank. Burners are encased in a heat-resistant high chrome-nickel jacket for durability.

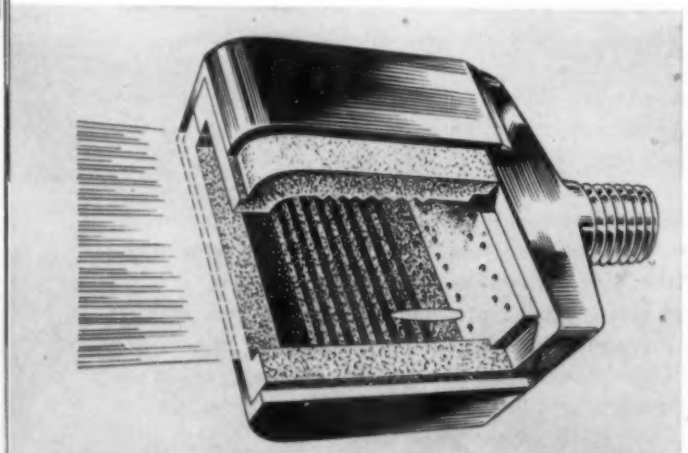
To prevent damaging the carbide by heat shock, superheated gases are directed at the tool shank, *Fig.* 3, with the carbide being heated by conduction. When brazing harder, more easily cracked grades of tungsten carbide, it is generally advisable to bring the heat into the carbide tip slower than if the tip were in the machined recess and subjected to direct heat conduction. Since gas burners allow free access to the workpiece, the carbide tip can be placed on top of the shank away from the hot recess. Gas-air burners accomplish this by allowing the operator free access to the work, permitting the placement of tungsten carbide on top of the shank away from the recess and the direct heat. When the proper temperature is developed in the shank, the insert can be slid into place and quickly brazed with minimum heat shock. Burners can also supply the fast heat needed to silver braze many harder grade carbides. Because the burners produce higher shank temperatures than does hand-torch heating, it is possible in some cases to replace silver alloy braze with a higher melting temperature material.

Automatic control of the heating cycle minimizes reliance on operator skill. Tool inserts, shanks and brazing material are pre-assembled. The operator places the elements in position between the burners and presses a button which changes the gas flow from idling to full-on. A timer controls the heat cycle, freeing the operator to load and unload the other brazing stations. At the end of a preset time, the brazing alloy is in the joint area. The burner flow is automatically reduced to the minimum rate to allow the joint to set sufficiently for removal.

To assure duplicate tool brazing results and develop maximum combustion efficiency, fuel gas is premixed in a gas combustion controller. This equipment premixes the low pressure fuel gas to a precise air-gas ratio and then compresses the mixture to 3 psig for delivery by pipe to the brazing machine table. Regulation of the air-gas mixture is accomplished over a turndown ratio of 20:1 from full flow to idling. Thus, each brazing station can operate independently, even though individual stations are supplied by a single combustion controller. Mixture control is adjusted at start-off to produce a slightly gas-rich flame and requires no further adjustment. The slight excess of gas in the flame envelops the heated area to prevent infiltration of free oxygen and scaling of the braze area.

Brazing production rates vary with tool size. Larger tool shanks require more heat and therefore more heating time. In a similar installation, it is reported that one operator can produce over sixty 2 x 1¾-inch tools per hour. Fuel cost is about 35 cents per hour, based on 700 Btu per cu ft of gas at 75 cents per thousand cu ft. Fuel costs for equivalent production using oxygen and acetylene was $5.56.

Brazing machines can also lower costs when used to retip old tools in a single heating operation. By increasing the heat slightly to remelt the brazed joint, and, if possible, not allowing the shank to cool, the old tip can be removed and a replacement inserted and brazed.



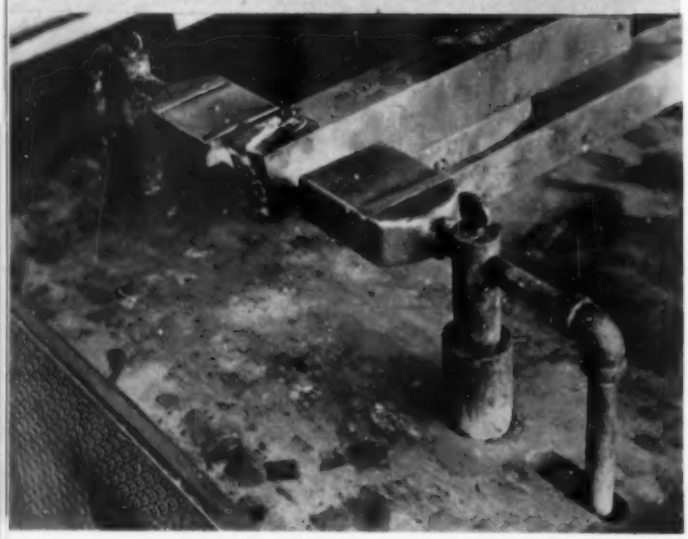


Fig. 2. (top) Burner, resembling a miniature jet furnace, was designed to fast-heat tool shanks for brazing carbide inserts. Manifold plate meters air-gas mixture (threaded end).

Fig. 3. (bottom) One of four automatically controlled stations on machine designed for brazing carbide insert to tool shank. Heating time is measured in seconds.

air-hydraulic conveyors

speed finishing operations

A GOOD CONVEYOR SYSTEM is one element necessary for the efficient movement of mass-produced parts through metal-finishing work stations. A plant's conveyors may be sufficient for present needs but increased production quotas could make them inadequate. If it is necessary to install or redesign conveyor systems, air and hydraulic cylinders should be considered since they can provide a timed cyclical movement of conveyor racks. Cylinders can also be used with conveyor switches to direct the travel of racks to various parts of the plant.

Conveyor engineers have enabled the Detroit Steel Products Co., Erie, Pa., to perform more phosphating and painting operations in less time than was required for previous production. This is accomplished by controlling the movement of conveyorized parts with air and hydraulic cylinders. Air pressure is produced by ordinary shop compressors. One operator stationed at a master control panel regulates part movements on the entire conveyor system.

Loaded conveyor racks are moved by an air cylinder from the loading area to a series of nearby phosphating tanks. The cylinder piston butts against and pushes the rack forward to center over the first of a series of tanks. Tanks, placed in proper sequence, contain alkali cleaner, hot water rinse, acid, phosphate solution, cold water rinse and chromic acid. The system is set up progressively to permit simultaneous use of each tank.

A hydraulic cylinder mounted on the conveyor lowers and raises the parts at the various tanks. Another hydraulic cylinder moves the racks transversely and centers them over the next tank. Total time for the phosphating cycle is 2½ minutes and is broken down as follows: lower, 15 sec; immersion, 90 sec; raise, 15 sec; advance to next tank, 15 sec; and unload, 15 sec.

After leaving the tanks the parts are carried through a drying oven. From there they travel to three paint dip tanks containing different colors and types of paint. The tanks, attached and set adjacent to each other, are horizontally movable. A hydraulic cylinder, controlled from the master panel, moves the tanks and positions the tank containing the proper color under the parts. Racks are lowered and raised by hydraulic pressure. Racks containing parts which do not require painting can be sent to another part of the area by the control panel operator.

Travel time of racks through an elevated paint baking oven is regulated by an air solenoid, limit switches and two air cylinders. Racks advance 14

— All photos courtesy Compressed Air and Gas Institute

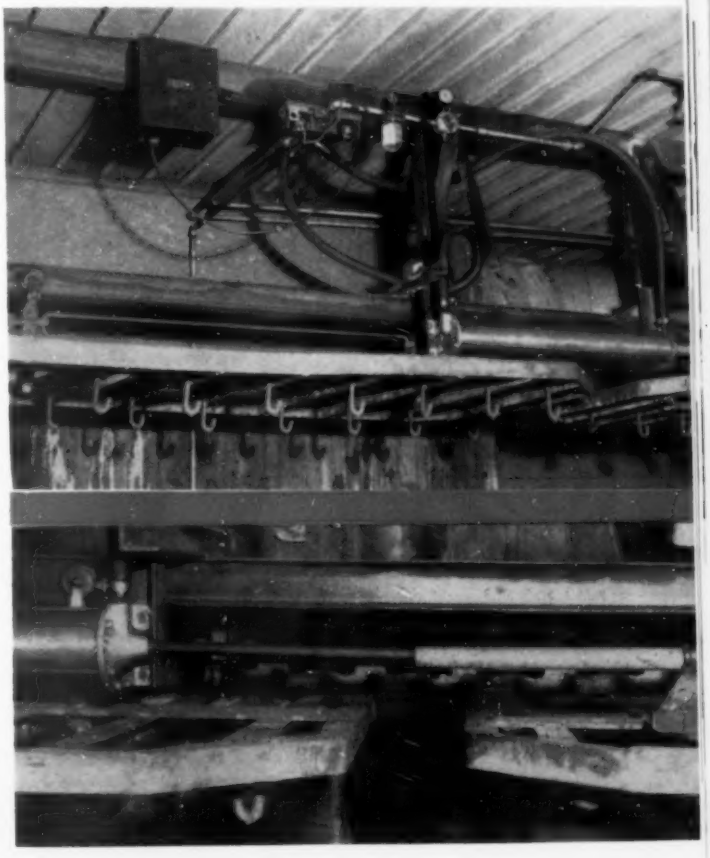


Fig. 1. (upper) Air cylinder, timer and solenoid combine to move conveyor through paint baking oven.

Fig. 2. (lower) Air cylinder piston is linked to channel iron (right) to move conveyor at 14-inch increments. Piston stroke is controlled by length of pipe.

Fig. 3. Finger points to dogs which catch on rack to move line forward.

Fig. 4. Trigger on conveyor racks trips limit switches which operate air valves to shift racks from one conveyor to another. Horn warns when a jam occurs.

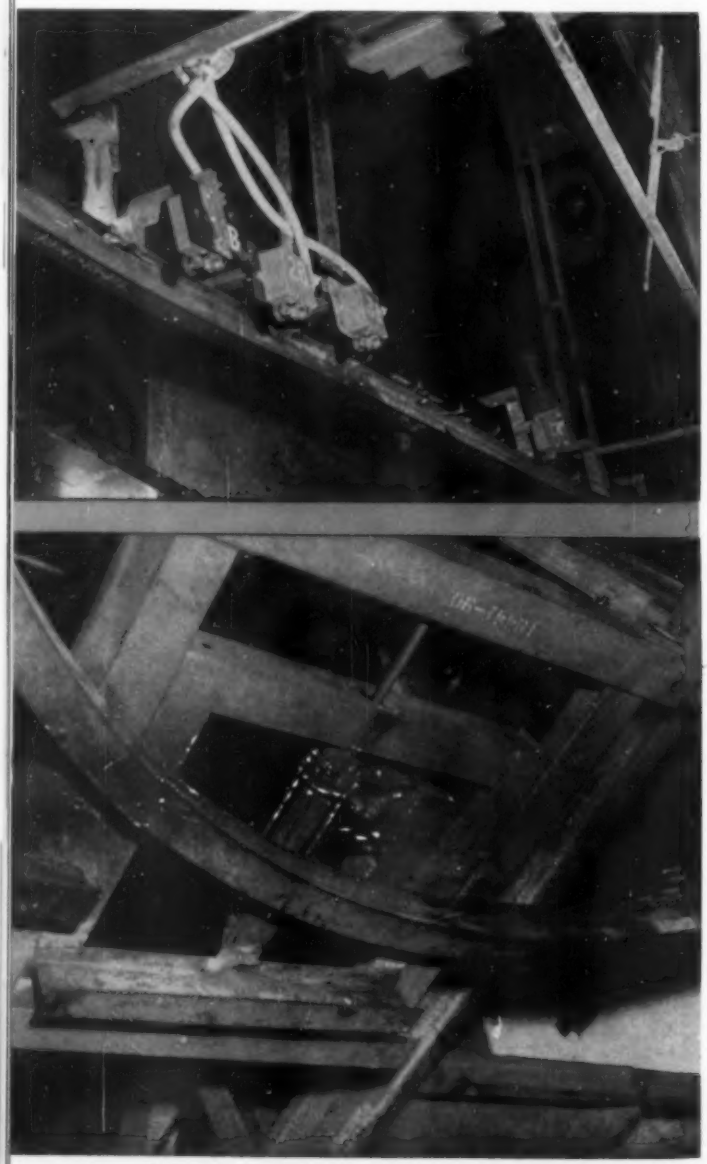


Fig. 5. Air cylinder mounted on greased frame enables certain racks to turn off to another part of the building. Segment of straight monorail is replaced by a curved piece.

inches at a step through the oven and then pause for 14-second intervals to assure even and thorough drying. A timer, *Fig.* 1 (upper left), set for 14 seconds, trips a four-way air solenoid which allows air to enter the cylinders. The air-filled cylinders work simultaneously and force out their pistons which, in turn, drive the racks forward 14 inches. This distance is controlled by a length of pipe, *Fig.* 2, which limits the return of the rods into the cylinders.

The end of each piston rod is connected to a 2-inch by 6-foot channel iron, *Fig.* 2 (right). Steel dogs mounted in the channels, *Fig.* 3, serve as ratchets. Thrust of the pistons moves the channels, and the dogs pivot freely on contact with each conveyor rack. At the outward limit of the pistons, air pressure is reversed in the cylinders and the pistons enter their respective cylinders, completing a return stroke. On the return strokes, the dogs, which are prevented from pivoting by a square corner opposite the chamfered corner, pull the line of conveyor racks toward the exit end of the baking oven. After leaving the oven the racks turn 180 deg on a curved rail and travel by gravity toward the floor.

Where the parts go after leaving the oven is predetermined at the start of the system. Final destination depends on which rack the parts are hung. Combinations of three steel triggers of different lengths are attached to each rack. When nearing the end of the gravity incline a trigger or flag energizes one of three limit switches, *Fig.* 4, which are mounted on the monorail at distances corresponding to the trigger lengths. Each switch operates a different two-way air valve which activates an air cylinder, one of which is shown in *Fig.* 5. The cylinder shifts a conveyor rack from a straight monorail to one of four curved rails. The curve monorail sections turn the racks 90 deg onto one of four spurs where the parts are sent to storage, shipping or to manufacturing areas for additional processing.

ACKNOWLEDGMENTS: Appreciation is extended to the Compressed Air and Gas Institute, Cleveland, Ohio and the Jervis B. Webb Co., Detroit, Mich., for assistance in preparing this article.

Economical Speeds and Feeds

for production turning

TOOL, PROCESS AND METHODS ENGINEERS will find that the following data offer a reasonable starting point when establishing balanced speeds and feeds on production turning machines. The data are based on dynamometer tests made under carefully controlled or measured conditions. When these data are applied, due consideration should be given to size of part, machine rigidity and metallurgical control of the workpiece.

Higher cutting speeds are feasible in many production operations and would lead to lower cycle time, better finish, greater accuracy and lower workpiece distortion. Excessive heat at the cutting edge limits cutting speed. Greater tool life can often be realized with heavier feeds than higher speeds, because depth of cut has less effect on temperature than does surface speed. Heat produced by high-speed turning, however, can be controlled through the use of an effective coolant applied in a large, free flow.

Plain Carbon and Alloy Steels: Poor machinability of low carbon steels is principally due to the large amount of free ferrite in their microstructure. Addition of sulfur, higher manganese content and cold drawing improve the machinability of these steels. Resulfurized steels contain sulfide inclusions that act to break up the ferrite matrix, producing a brittle chip. Addition of alloys increases the bar hardness, which improves machinability. Cold drawing reduces the ductility of the free ferrite, which also improves the machinability. Machinability of steels increases with increasing carbon content up to about 0.35 percent.

High-carbon steels show best tool life when in spheroidized condition, obtained when they are cooled slowly through the critical range. Free-machining steels have sulfur which reduces the ductility without increasing the shear stress. This conforms with the theory that ideally, the best machining properties are obtained when the metal has a low unit shear stress and forms a brittle chip.

Through-hardening alloy steels, quenched and

Table 1—Steel Machinability
(B-1111 = 100)

Class 1					
C-1109	85	C-1115	85	C-1117	85
C-1118	80	C-1120	80	C-1132	75
C-1137	70	C-1022	70	C-1016	70
C-1018	70	B-1111	95	B-1112	100
B-1113	135	C-1213	130	A-4023	70
A-4027	70	A-8620*	90	A-4140*	75
Class 2					
C-1141	65	C-1020	65	C-1030	65
C-1035	65	C-1040	60	C-1045	60
A-2317	55	A-3115	60	A-3130	55
A-3140	55	A-3145	50	A-4032	65
A-4037	65	A-4042	60	A-4047	55
A-4130	65	A-4140	60	A-4145	55
A-4150	50	A-4320	55	A-4615	65
A-4640	55	A-4815	50	A-5120	65
A-5140	60	A-5150	55	NE-8630	60
NE-8140	60	NE-81B45	55	NE-8620	65
NE-8640	60	NE-8740	60	NE-8745	55
		NE-9440	60		
Class 3					
C-1008	50	C-1010	50	C-1015	50
C-1050	50	C-1095	45	C-1320	50
C-1330	45	C-1340	45	A-2330	50
A-2340	45	A-4340	45	A-6120	50
A-6145	45	A-6150	45	A-9255	45
		E-52100	40		

*Leaded

Data Courtesy **The Monarch Machine Tool Co., Sidney, Ohio**

Table 2—Carbon and Alloy Steel Speeds and Feeds

Depth of Cut (inch)	Feed (inch per rev)	Surface Speed* (ft per min.) Class 1 (average 160 Bhn) HSS†	Class 1 (average 160 Bhn) Carbide	Class 2 (average 207 Bhn) HSS	Class 2 (average 207 Bhn) Carbide	Class 3 (average 260 Bhn) HSS	Class 3 (average 260 Bhn) Carbide
1/32	0.008	400	1000	240	850	120	500
	0.015	300	950	180	700	90	400
1/16	0.003	325	900	200	800	100	450
	0.015	250	700	150	600	75	350
1/8	0.008	260	750	160	550	90	350
	0.015	200	600	120	450	60	300
	0.031	140	450	85	350	45	250
3/16	0.008	230	700	140	520	75	300
	0.015	180	550	110	450	55	250
	0.031	130	350	80	300	40	225
1/4	0.008	210	600	125	500	65	300
	0.015	160	500	100	450	50	225
	0.031	115	350	70	300	35	200
3/8	0.015	145	450	90	350	45	250
	0.031	100	300	60	275	30	200
	0.062	70	250	45	200	23	175
1/2	0.015	130	300	80	300	40	200
	0.031	90	250	55	250	28	150
	0.062	65	200	40	150	20	60
	0.093	50		30		16	
	0.125	40		25		13	
3/4	0.031	80	250	50	200	25	150
	0.062	55	175	35	150	18	
	0.093	45		25		13	
	0.125	35		22		11	

*Speeds based on two-hour tool life.

†Reduce speeds for rough steel forgings and cast steels. For best tool life, use heavier feed and lower surface speed.

tempered, have high hardness and low ductility. High chip-tool temperatures occur during turning and cutting speeds must be reduced to obtain normal tool life. Feed rates should be maintained below 0.018 ipr. Quenched and tempered steels are commercially machinable up to a hardness of 400 Brinell if proper coolants are used during the machining.

Chemical coolants and soluble oils form aqueous solutions or emulsions that have high heat capacity. Their lubrication properties are improved by adding antiweld agents. High-speed turning of ferrous metals normally requires a large free flow of a water soluble coolant. The coolant should have good wetting properties and proper rust inhibitors. If carbide tools fail because of overheating, a chemical coolant should be used in dilutions of 40-60:1. For normal flank wear, a soluble oil in a dilution of 30:1 should be used. If cratering is severe, chemical active or sulfunated soluble oil in dilutions of 20-40:1 should be used.

Tool Steels: Best machinability is obtained on tool steels with uniform spheroidized microstructures free from carbide segregation, banding and lamellar pearlite. Tool steels have higher annealed hardness and lower ductility than most medium-carbon alloy steels.

Chip-tool temperatures and tool forces are relatively high. Carbide tooling should therefore be rigid and free of brazing strains. Tools will show abrasive flank wear and heat failure when speeds are excessive. Cratering of the tool surface is normally not serious since the amount of secondary shear is small. To prevent early heat failure of the tool, a soluble oil coolant should be used. Some gain is obtained from extreme pressure additives but high heat capacity is more important.

Light feeds and low cutting speeds should be used to reduce tool pressures and prevent overheating. Tool steels tend to form a built-up edge. This can be reduced by using a higher side rake and increasing the cutting speed. Carbide cutting tool grades

Table 3—Tool Steel Machinability, Speeds and Feeds

Type	Machinability (B-1112 = 100)	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness (Brinell)
Plain Carbon	50	225-350	0.010-0.025	300-400	0.005-0.010	179-207
Manganese Oil Hardening	45	200-300	0.012-0.025	250-300	0.003-0.010	192-223
High Carbon Chromium	30	175-250	0.012-0.018	225-275	0.003-0.010	217-235
Low Tungsten Chromium	35	175-250	0.012-0.025	225-275	0.005-0.010	207-217
High Tungsten	40	200-275	0.012-0.018	250-300	0.003-0.010	223-240
High Speed	30	120-275	0.012-0.018	175-300	0.003-0.010	217-240

Table 4—Stainless Machinability (B1112-100)

Ferritic—Straight Chrome							
405	60	406	50	430	50	442	60
442	<50	446	65	430-F	90		
Martensitic—Heat Treatable							
403	55	410	50	414	60	416	85
410	50	420-F	70	431	54	440	40
420	50					502	70
501	70						
Austenitic—Chrome Nickel							
302	55	303	60	304	45	309	48
316	46	317	45	321	50	347	48

should be selected to resist thermal shock and edge wear. Graphitic and free-cutting tool steels result in from 30 to 40 percent improved tool life.

Stainless Steels: Austenitic grades are more difficult to machine because of their tendency to cold work. Stainless steels have about the same machining characteristics as low-carbon steels except they have higher unit stresses and lower heat conducting rates. Cutting edges of tools should be honed to minimize tool build-up.

Best machinability is obtained when ferritic and martensitic grades are cold drawn. Soft, annealed bars tend to tear and drag during machining. Cast alloys normally have lower machinability than do the wrought steels. Additives that improve the machinability of stainless alloys include: selenium, sulfur and lead. Tools should be large to dissipate heat generated by machining. Feed rates should be large enough to keep the tool from glazing the work surface.

Since stainless steels have relatively low thermal conductivities and high unit shear values, excessive chip-tool temperatures result. To gain maximum tool life, a heavy-duty soluble coolant should be used during machining.

Heat Resistant Alloys: This series of alloys contains combinations of chromium, nickel, cobalt and molybdenum, with tungsten and titanium as minor constituents. They are difficult to machine and parts are usually made by investment casting. Machining is possible provided the tooling is rigid. Shear type rake angles and large lead angles are used, and a steady flow of coolant is applied. When carbide tools are used for turning, they show considerable wear due to flank abrasion.

Distortion and strain produced by the tool cause the work surface to strain-harden. Feeds should be held steady and second finish cuts avoided. Most of these alloys machine best in the "solution treated" form. These materials build severely on tools. To prevent work hardening and glazing, feed should be above 0.006 ipr. On intermittent cuts, high-vana-

Table 6—Heat Resistant Alloy Speeds and Feeds

Type	Speed (ft per min.)	Feed (in. per rev)
S495	40-90	0.010-0.030
S590	30-60	0.015 min.
S816	30-60	0.015 min.
Discalloy	40-110	0.015 min.
Refractory	20-50	0.015 min.
Nickel	200-275	0.015-0.020
Inconel	60-120	0.015-0.025
Timken	150-250	0.015-0.030
Konal	100-175	0.015-0.025
Hastelloy B	40-100	0.015-0.030
Hastelloy C	40-100	0.015-0.030
6059	30-60	0.015 min.
Vitallium	10-40	0.015 min.
Stellite	10-40	0.015 min.
19-9 DL	125-250	0.010-0.030
Titanium C-9466	60-120	0.010-0.030
Titanium 150A	80-120	0.010-0.020
Titanium MST	60-80	0.010-0.020

Table 5—Stainless Steel Speeds and Feeds

Type	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness Annealed (Brinell)
302	120-200	0.007-0.015	175-250	0.005-0.007	135-185
303	200-300	0.007-0.015	250-350	0.005-0.007	
316	150-250	0.007-0.015	200-300	0.005-0.007	
321	150-250	0.007-0.015	200-300	0.005-0.007	
347	150-250	0.007-0.015	200-300	0.005-0.007	
410	225-300	0.005-0.015	300-400	0.003-0.007	160-220
416	200-350	0.005-0.015	350-450	0.003-0.007	
420	175-250	0.005-0.015	200-300	0.003-0.007	
420-F	200-300	0.005-0.015	300-450	0.003-0.007	
430	175-250	0.005-0.015	300-400	0.003-0.007	
440	120-200	0.005-0.015	200-275	0.003-0.007	
446	170-225	0.005-0.015	250-350	0.003-0.007	

Stainless steels can be cut up to 450 sfpm if high side rake angles, light feeds and proper coolants are used.

Tool should not be allowed to dwell in one place.

Work and tool should be sufficiently rigid to prevent chatter and work surface distortion.

Table 7—Cast Iron Machinability (B1112=100)

Type	Hardness (Brinell)	Machinability
Ferrite iron—flake graphite	120	110
Nodular iron—20% ductility	170	90
50% pearlite	150	70
Coarse pearlite	195	70
Fine pearlite	218	65
5% steadite—pearlite	197	60
5% free carbide	240	50
Mottle iron	300	40
Chilled iron	500	40

Some castings contain several of the above structures due to their section size and cooling rate.

dium, high-speed steel tools and reduced speed should be used.

Because of the low thermal capacity of these alloys, heavy-duty chemically active soluble oils should be used during machining. Detergent type emulsions and chemical coolants have also been found to be successful in some instances because of their large cooling ability.

Cast Iron: Nickel in cast iron acts to restrain chill and as a graphitizer, thereby improving machinability. Sulfur and phosphorous tend to harden the ferrite matrix. High phosphorous forms an abrasive eutectic that reduces machinability. Carbide formers that stabilize the pearlite, such as chromium, molybdenum and manganese, produce an iron of higher hardness and lower machinability.

Most of the tool wear experienced is abrasive flank wear. Some fine grain irons, which produce nearly continuous chips, will cause mild cratering. Tungsten carbide tools are used because of their high resistance to edge wear.

Surface finish improves as the depth and feed are reduced; the nose radius is increased and the structure becomes finer. Large graphite flakes tear out of the finished surface leaving a poor surface. Cast iron parts are often annealed at 1450 F to reduce hardness and improve machinability. To reduce distortion during machining, parts are frequently stress relieved at 1200 F prior to machining. Sharp cutting edges should be kept on all tools. Rigid tooling is required since cast iron has a natural tendency to chatter.

Nickel Alloys: These alloys have lower machinability than alloy steels but can be readily machined with carbide tooling of proper rigidity. Compared to B-1112 = 100, nickel and monel rolled bars have machinability indexes of 40 to 55. Cast alloys have slightly lower indexes.

Correct rake angles are important when machining these alloys. Speeds are somewhat lower and feeds lighter than those used for mild steel. Wrought commercial nickels are difficult to machine because they work-harden rapidly during machining. Cast monel alloys have high silicon content and are abrasive. They have lower machinability ratings than wrought alloys.

Positive rake angles should be used to reduce tool

Table 8—Cast Iron Speeds and Feeds

Type	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness (Brinell)
Ferritic	400-600	0.015-0.020	600-900	0.010-0.015	120
Nodular	400-600	0.015-0.020	600-900	0.010-0.015	170
Coarse Pearlite	350-500	0.015-0.020	400-600	0.010-0.015	197
Fine Pearlite	250-350	0.015-0.025	300-450	0.010-0.015	218
5% Carbide	200-300	0.015-0.025	275-350	0.010-0.015	240
Mottled	150-250	0.020-0.030	200-275	0.015-0.020	270
Malleable	375-550	0.015-0.020	500-700	0.010-0.015	140
Chilled	100	0.035-0.040	125	0.015-0.020	RC47
Chilled	80	0.035-0.040	100	0.015-0.020	RC56
Chilled	50	0.035-0.040	65	0.015-0.020	RC60

Table 9—Nickel Alloy Speeds and Feeds

Type	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness Cold Drawn (Brinell)
Duro Nickel	150-225	0.012-0.020	175-250	0.003-0.009	135-185
Ni Resist*	75-160	0.015-0.025	125-175	0.006-0.012	.....
Monel	125-200	0.010-0.020	175-275	0.003-0.010	160-230
K Monel	125-175	0.010-0.020	100-200	0.003-0.010	160-230
R Monel	150-250	0.010-0.020	225-300	0.003-0.010	160-230
KR Monel	150-250	0.010-0.020	225-275	0.003-0.010	160-230

*Austenitic nickel cast iron.

Table 11—Copper Alloy Speeds and Feeds

Type	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness Cold Drawn (Brinell)
Group 1	500-1200	0.007-0.020	800-1400	0.005-0.009	83-150
Group 2	400- 700	0.007-0.018	500-1000	0.003-0.008	83-150
Group 3	250- 600	0.003-0.015	300- 800	0.003-0.005	124-217

pressure. A side lead angle should be used whenever possible. Cutting edges should be honed. Best machinability is obtained on cold drawn nickel and monel bars. Nickel alloys should be stress relieved prior to machining. Soluble nonsulfurized mineral oil diluted in a ratio of 20:1 should be used as a coolant.

Table 10—Copper Machinability (Free-cutting brass = 100)

Group 1—Free Cutting			
Leaded Copper	80	Forging Brass	*80
Free-Cutting Brass	100*	Leaded Naval Brass	70
Low-Leaded Brass	70	Architectural Bronze	90
High-Leaded Brass	90	Leaded Nickel Silver	80
Group 2—Average Machinability			
Red Brass	30	MG Bronze	30
Low Brass	30	Cartridge Brass	30
Muntz Metal	40	Al-Si Bronze	60
Naval Brass	30	Leaded Si Bronze	60
Leaded Ni Silver	50		
Group 3—Difficult to Machine			
Copper	20	Commercial Bronze	20
Aluminum Bronze	20	Beryllium Copper	20
Nickel Silver	20		

*If B-1112 = 100, free-cutting brass would have a machinability rating of about 200.

Table 12—Aluminum Machinability

Wrought Alloys							
35	C	11S	A	14S	B	17S	B
18S	B	24S	B	32S	C*	51S	C
52S	C	56S	B	61S	C	63S	C
		75S	B				
Cast Alloys							
13	C*	43	C	85	C	108	C
113	B	122	A	132	C*	138	B
142	B	195	B	212	B	214	B
220	A	319	C	355	C	360	C*
380	C					750	A

Key: A = Excellent machinability
B = Average machinability
C = Abrasive or too soft
C* = Abrasive

Copper Alloys: Machinability of alloys having more than 64 percent copper can be improved by addition of 0.2 to 3.0 percent lead. The lead remains insoluble in the alloy and breaks up the single phase microstructure. Machinability is also improved by addition of sulfur, selenium and tellurium. Muntz metal has better machinability than the nonleaded brasses. Naval and tobin bronze have good machinability. Most bronzes are more difficult to machine than yellow brass but are more machinable than carbon steels. Everdur and phosphor bronzes have relatively poor machinability unless they are leaded. Copper, when nonleaded, is soft and tears easily during machining. Best results are achieved with free-machining additives.

Better turning results when using a balance of high speeds and light feeds. Roughing cuts should be under 0.2 inch; finishing cuts under 0.070 inch. When machining alloys in Group 3, side rake angles should be reduced with increased hardness. Chatter can be avoided by reducing nose radius and grinding a land on the cutting edge of the tool. Sulfur-free soluble oil can be used as a coolant if necessary.

Aluminum Alloys: Metals that readily enter into solid solution with aluminum, such as copper, zinc and magnesium, improve its machinability. Most aluminum alloys show considerable tool build-up when machined. This can be relieved by using higher speeds, a large side rake angle and honing the cutting edges. In general, the heat-treatable alloys, if not in the solution treated state, are less machinable than the nonheat-treatable alloys. Heat-treatable alloys machine to a better finish after solution treatment because they have less build-up and gumminess. Aluminum and most of its alloys can be

Table 13—Aluminum Alloy Speeds and Feeds

Type	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness 500 kg (Brinell)
Classes A and B	800-3000	0.007-0.012	1800-6000	0.003-0.008	40-85
Class C	500-1000	0.003-0.008	500-1500	0.002-0.006	100-125

Hold roughing depth below 0.250 inch and finishing depth below 0.050 inch.
Higher surface speeds may be used if rigid machine tools are available.

Table 14—Magnesium Alloy Speeds and Feeds

Max Depth (inch)	Roughing Speed (ft per min.)	Roughing Feed (in. per rev)	Finishing Speed (ft per min.)	Finishing Feed (in. per rev)	Hardness (Brinell)
0.300	300-600	0.010-0.040	....	....	....
0.200	600-1400	0.010-0.025	....	....	46-73
0.100	....	....	600-1000	0.005-0.012	....
0.050	....	....	1200-1800	0.005-0.010	....

On finishing, minimum feed rate is 0.003 in. per rev.

machined at high surface speeds with moderate feeds. Excessive feeds (above 0.020 ipr) will cause an appreciable reduction in tool life.

Rake angles and clearance angles should be larger than normal. Aluminum has a high thermal conductivity and low heat capacity which leads to work distortion if tool temperatures are excessive. If surface finish is poor, rake angles should be increased, chip flow directed away from the work and a soluble type coolant applied. Cast nonheat-treatable alloys tend to produce build-up and smear instead of shearing during the cut. High silicon alloys produce a gray instead of a bright finish.

Magnesium Alloys: Magnesium alloyed with aluminum, zinc and manganese represents a series of free-cutting alloys that all have the same relative machinability. They have low heat capacity and high thermal expansion rates that make it difficult to hold size on thin sections. In general, these alloys have a low shear value and machine to a fine finish when using sharp tools. Best tool life is obtained using abrasion resistant straight tungsten carbides.

Light feeds should be avoided. The surface speed should be kept down if the chip thickness is small. Tools should not be allowed to dwell on the workpiece. When coolants are not used, surface speeds should be kept below 600 ft per min. Low viscosity nonsulfunated mineral oil having a minimum flash point of 275 F can be used as a coolant. Water soluble and alkaline coolants should not be used when machining magnesium.

Table 15—Tool Angles that Give Good Results at Indicated Speeds and Feeds

Material and Operation	Back Rake (deg)	Side Rake (deg)	Clearance (deg)	Side Cutting Edge Angle (deg)	Front Cutting Edge Angle (deg)	Grade Carbide (Code No.*)
Plain Carbon and Alloy Steels						
Roughing	-7 to 0	-7 to 9	4	15 to 30	9	C-5
General Machining	0	6 to 9	6	0 to 15	9	C-6
High Speed and Finishing	0	9 to 15	6	0 to 10	9	C-8
Tempered Stock	0	-4 to 6	6	0 to 10	9	C-7
Annealed Tool Steels	0	9 to 12	7	0 to 15	9	C-5 C-7
Stainless Steels						
Martensitic	0	6 to 9	6	10 to 15	9	C-2
Ferritic	0	6 to 9	6	10 to 15	9	C-5
Austenitic	0	9 to 15	10	15	9	C-2
Heat Resistant Alloys						
Titanium	0	12	6	15 to 30	9	C-2
Cobalt-Nickel	-6	9	6	30	9	C-5
Cr-Ni-Mo	-6 to 0	6 to 9	6	30	9	C-2 C-5
Cast Iron						
Ferritic	0	8	7	...	9	C-2 C-3
Nodular	0	8	7	...	9	C-2
Pearlitic	0	8	7	...	9	C-2 C-3
Chilled	0	4	6	...	6	C-2
Cold Drawn Nickel	0	7 to 12	7	15 to 30	10	C-5 C-6
Copper Alloys						
Group 1	0	4 to 8	7 to 9	10 to 15	10	C-2
Group 2	0	4 to 8	7 to 9	10 to 15	10	C-2
Group 3	0 to 5	12 to 20	7 to 10	10 to 15	12	C-2
Aluminum Alloys						
Machinability A & B	6 to 15	10 to 20	7	10 to 30	10	C-2
Machinability C	0 to 6	9 to 12	7	10 to 15	10	C-2
Magnesium, General	0 to 6	10	7	0 to 15	12	C-2

*See Page 117 THE TOOL ENGINEER, January 1955.

First industry contribution to aid in the program being carried out by the ASTE Research Fund Committee was presented recently by Dr. William J. Sweeney, left, vice president of Esso Laboratories, to Col. Leslie S. Fletcher, Research Committee director.

NEWS

featured this month

chapter news

An important week on the ASTE calendar is fast approaching. Coming up is the most significant event of the year for ASTE members—the 1955 Western Industrial Exposition and 23rd Annual Meeting—being held March 14-18 in Los Angeles. As in years past, the March issue of THE TOOL ENGINEER will preview the exposition and convention, providing valuable information for members planning to attend, as well as those who cannot. It will contain special editorial features, a detailed exposition directory and the complete convention program.

Even the technical section will take on a western flavor with articles on West Coast activities by West Coast authors. Typical papers scheduled for presentation at Los Angeles will be previewed. The special exposition section, based on product information received from exhibitors, will highlight the most significant developments in production, machines and processes.

The detailed exposition directory will include a diagrammed floor plan of Shrine Exposition Hall, a listing of exhibitors and products, as well as booth numbers. This section should be invaluable for those who like to plan in advance what exhibits to see first. A round-up of the week's activities will be featured in the ASTE News section.

Of course, in addition to features on the exposition and annual meeting, regular departments—ASTE Chapter News, Tools of Today, Progress in Production, and Gadgets—will also appear in the March issue. Scheduled to be mailed from the printers on February 25, it will be one of the biggest issues of 1955.

RIVERSIDE *chartered*

Ben J. Hazewinkel, left, a national director of the Society, presents the charter to Riverside's chairman, E. W. Denny. Wayne Ewing, right, ASTE national secretary and also a national director, looks on.

Riverside, the 122nd chapter to join ASTE ranks, received its charter on December 3. Ceremonies which made the California chapter an official member of the Society, were held at the Victoria Country Club in Riverside.

Chartering officer was Wayne Ewing, national ASTE secretary. He was ably assisted by Ben J. Hazewinkel, an ASTE national director; Alfred E. Beaumont, area lieutenant of the National Membership Committee; J. E. Riddle, chairman of the Los Angeles chapter; and Paul Jones, chairman of the Santa Ana Valley chapter.

Special guests included J. Harold Backstrand, mayor of Riverside; Oren L. King, city manager of Riverside; Norman E. Geib, president of Riverside Chamber of Commerce; Col. G. F. Friederichs, commander of March Air Force Base; and W. G. Colburn, manager of the Riverside Chamber of Commerce. Local industrial management as well as the neighboring chapters were well represented.

Officers of the chapter were installed by Wayne Ewing. From left are: E. W. Denny, chapter chairman; Les Heustis, first vice chairman; Don Watkins, second vice chairman; Ed Busher, delegate; Wayne Ewing; Hugh Foster, treasurer; and Dick Myles, alternate delegate.

Last Call for Scholarship Applications

A new dead line, February 15, has been set for accepting applications for ASTE International Education Awards, according to an announcement by Prof. Robert E. McKee, chairman of the National Education Committee. The deadline has been moved up from March 1 to February 15 in order that announcement of the winners may be made at the annual meeting in Los Angeles to be held March 14-18, he said. A total of $7,000 in scholarship money will go to ten outstanding engineering students in the United States and Canada. For application forms or for further information, write to the National Education Committee, ASTE National Headquarters, 10700 Puritan Ave., Detroit 38, Mich.

Los Angeles, third largest city in the nation, will be host on March 14-18 to the first ASTE Industrial Exposition to be held in the West.

Tooling for Western Expansion

to keynote ASTE's 1955 Industrial Exposition

By Nancy M. Houston
News Editor

Traditional ASTE exposition activities will take on new flavor this year when the Society holds its first Western Industrial Exposition and the 23rd Annual Meeting in Los Angeles, March 14-18. Theme for the five-day event is "Tooling for Western Industrial Expansion."

Both the exposition and the annual meeting, to be held concurrently, are keyed to the production problems of western industry's growth. All technical sessions, plant tours and exposition exhibits will point up the latest developments in production machines and processes.

Scene of the exposition will be the Shrine Auditorium and Convention Hall where more than 270 companies will exhibit machines, tools and processes best suited to meet the demands of western industry.

Always a special highlight of ASTE convention activities, the annual membership banquet and installation of officers this year will be held March 17 at the Cocoanut Grove in the Ambassador Hotel. Speaker will be Prentiss M. Brown, immediate past chairman of the board of Detroit Edison Co. and former United States Senator. During the banquet, the Society's four new honor awards will be granted for the first time.

New national directors of ASTE will be elected by members of the House of Delegates at their meeting being held at the Hotel Statler on Wednesday,

March 16. Officers will be named at the Board of Directors' meeting on Thursday, March 17.

Plant tours scheduled during exposition week will enable ASTE visitors to view operations at six industrial firms in the Los Angeles area. Included on the tour list are: National Supply Co.; McCulloch Motors Corp.; Byron-Jackson Corp.; Airesearch Manufacturing Co.; North American Aviation, Inc.; and Lockheed Aircraft Corp.

U. S. Citizenship Required

The last three companies require evidence of United States citizenship of their visitors and emphasize the "no cameras" ruling. Since tours are limited to no more than 200 participants, and some to only 50, early plant tours registration is urged.

Technical sessions will find over 40 of the nation's leading executives and engineers addressing ASTE audiences at the Shrine Auditorium and the Ambassador Hotel. General topics for the five days are: Monday, March 14—Professional Development Day; Tuesday, March 15—Pressworking Day; Wednesday, March 16—Management Day; Thursday, March 17—Processes Day; Friday, March 18—Precision Control Day.

Co-sponsors will participate in two of the technical meetings. The Southern California Section, Society of Plastics Engineers, will share in the sponsorship of the March 15 morning session and the Los Angeles chapter of the American Society for Quality Control will co-sponsor a meeting on March 18.

Schedule for Opening Day

No morning sessions are scheduled for opening day. The first lecture will be held at 2 p.m. when Raymond L. Nelson, development engineer in Dow Chemical Company's Magnesium Technical Service, Midland, Mich., speaks on "Magnesium Plate for Strong Light-Weight Fixture Construction."

General topic for the second session, starting at 2:30 p.m., will be "Industrial Numbering Codes." Speakers will be Dr. Mortimer Taube, president, Documentation, Inc., of Washington, D.C., and James A. Catto, manager of Ford Motor Company's Administrative Services Department in Detroit. Dr. Taube will speak on "Uniterm Coding of Technical Data" and Mr. Catto will speak on "Coding and Administration of Engineering Drawings."

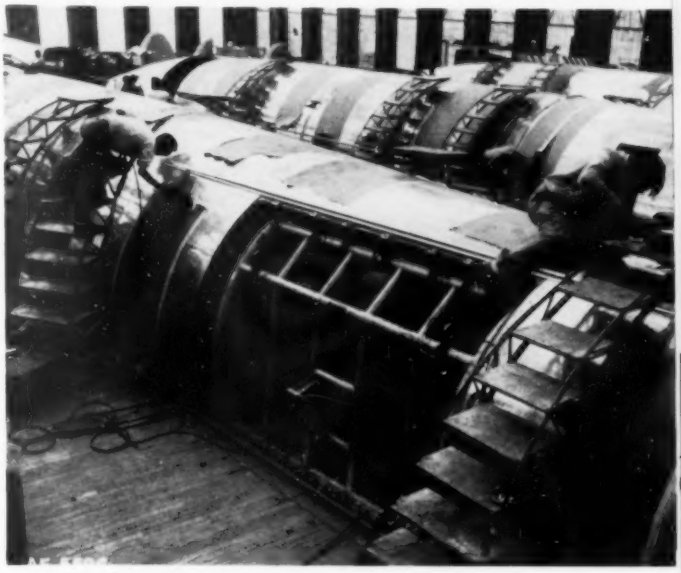
"Tool Engineering Research in Action" will be the topic for the Monday evening session at 8 o'clock in the Ambassador Hotel. Dr. Erik K. Henriksen of the University of Missouri's College of Engineering will speak on "Findings and Directions in Chip Breaker Design." Carl J. Oxford, Jr., research engineer at National Twist Drill & Tool Co., Rochester, Mich., will speak on "Recent Developments in Drilling Research." Col. Leslie S. Fletcher, ASTE research fund director, will report on ASTE research into workpiece temperature distribution.

First session on Tuesday, March 15, will be held at 9:30 p.m. and co-sponsored by the Southern California Section of the Society of Plastics Engineers. General topic will be "Plastic Tooling for Production." Chairman will be Walter H. Kadlec, president of the group.

Speakers and their topics are: John Delmonte, general manager, Furane Plastics, Inc., Los Angeles —"Improved Designs for Plastic Tooling;" Louis E. Frost, tool engineer, North American Aviation, Inc., Inglewood, Calif.—"Cast Plastic Tooling as Used in Aircraft;" Richard Morozowicz, plastics engineer,

(Please turn page)

At Lockheed Aircraft Corp., one of six West Coast firms on ASTE's schedule of plant tours for exposition week, visitors will see the use of strangely shaped ladders and heavy paper to protect aluminum skins during aircraft assembly.



ASTE members will also tour North American Aviation, Inc., home of the famed one-man interceptor, the North American F-86D Sabre Jet.

Douglas Aircraft Co., Santa Monica, Calif.—"Reinforced Laminates in Aircraft Tooling;" George C. Adams, staff engineer, Rezolin, Inc., Los Angeles—"Are Plastic Tool Standards Needed?" G. J. Walkey, manufacturing research engineer, Lockheed Aircraft Corp., Burbank, Calif., will be the session moderator.

Discussion on Presswork Tools

"Presswork Tools and Methods" will be the topic for a panel discussion Tuesday afternoon at 2 o'clock. Members of the panel will be: Harry Aikens, factory manager, Norris-Thermador Corp., Los Angeles; Max Lauderback, superintendent of metallurgy, Kaiser Steel Corp., Fontana, Calif.; Alfred T. Rando, partner, B & M Engineering Co., Burbank, Calif.; E. C. Rork, plant manager, Arcturus Manufacturing Co., Venice, Calif.; and L. H. Trautman, Aluminum Co. of America, Pittsburgh.

There will be two evening sessions Tuesday, both starting at 8 p.m. "Advantages in Leasing Production Equipment" will be discussed by R. A. Perkins, assistant secretary-treasurer, Kearney & Trecker Co., Milwaukee, and "Setting Goals in Automation" will be discussed by W. Fay Aller, director of research, Sheffield Corp., Dayton, Ohio.

"Preparing Engineers for Manufacturing Responsibilities" will be the topic for the Wednesday morning session on March 16. General chairman will be the head of ASTE's National Education Committee, Prof. Robert E. McKee of the University of Michigan.

The session will be divided into two parts. Moderator for the first section will be R. L. Hand, manager, general department 28-01, Lockheed Aircraft Corp., Burbank, Calif. Speakers and their topics are: L. M. K. Boelter, chairman of the Department of Engineering, University of California at Los Angeles—"General Approach to Realistic Manufacturing Engineering Curricula;" Dr. Ralph J. Smith, head of the Engineering Department at San Jose State College—"Specialized Approach to Realistic Manufacturing Engineering Curricula."

Moderator for the second section will be J. L. Crawford, superintendent of tool fabrication, Santa Monica Div., Douglas Aircraft Corp. Speakers and their topics will be: G. W. Papen, production engineering department manager, Lockheed Aircraft Corp.—"In-Plant Engineer Training for Large Organizations"; D. Palmer, president, Dwight Palmer & Associations, Los Angeles—"In-Plant Engineer Training for Small Organizations."

"Gears and Splines" will be the general topic for the afternoon session starting at 2 o'clock. "Planning for Effective Gear Inspection" will be discussed by Fred Bohle, manager of machine development, Illinois Tool Works, Chicago. "Roll-Flowed Forming of Splines and Serrations" will be discussed by Harry Pelphrey, chief research engineer, Michigan Tool Co., Detroit.

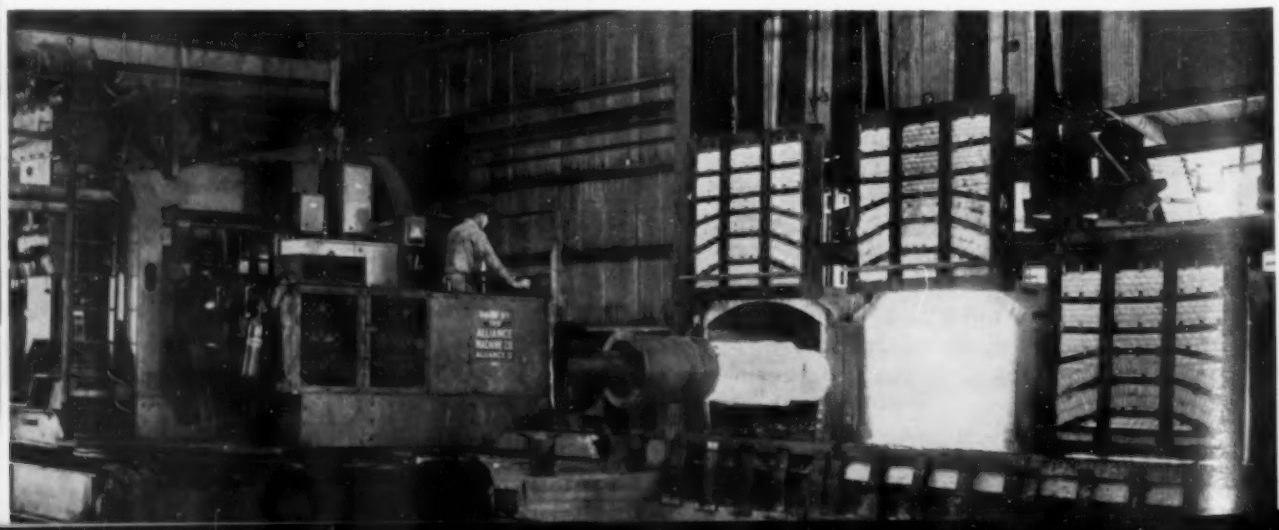
The Wednesday afternoon session at 2:30 will be a discussion of "Selection of General-Purpose vs. Special Purpose Machines" by D. E. Hawkinson, vice president, machine tool sales, Greenlee Bros. & Co., Rockford, Ill.

Management Day Panel

"Coordination of Manufacturing Management" will be the topic for the panel discussion Wednesday evening at 8 o'clock.

Panel moderator will be J. R. Weaver, manager of manufacturing engineering, Westinghouse Electric Co., Springfield, Mass. Panel members will be: E. W. Ernst, manager, machine tool equipment and planning, General Electric Co., Louisville, Ky.; R. J. Gould, superintendent, Motorola, Inc., Chicago; R. J. Mountain, chief industrial engineer, Pacific

One of California's most outstanding companies and a national leader in the oil tool industry, the Torrance plant of National Supply Co. manufactures large rotary drilling machinery and equipment, and produces a variety of products for other industries, including forgings, heavy machinery, ordnance material, and aircraft parts. Shown below, an 11-ton manipulator takes an ingot from a preheat furnace.



Di[illegible]ndix Aviation Corp., North Hollywood; and A.[illegible]ignorelli, president, Design Service Co., N.Y. [illegible]ling for Noferrous High-Temperature and Pr[illegible]n Products" will be the general topic for the Th[illegible]ay morning session at 9:30.

Ceramic Parts and Tools

"Mercury-Pattern Precision-Cast Design and Tooling" will be discussed by Dr. Irvin R. Kramer, vice president, Mercast Corp., N.Y. "Ceramic Parts and Tooling for High-Temperature Applications" will be discussed by Dr. R. F. Rea, manager, Research & Development Branch, Stupakoff Ceramic Manufacturing Co., Latrobe, Pa.

The afternoon session at 2 o'clock will have "Shells and Extruded Products" as its general topic. Speakers and their subjects will be: W. R. Powl, plant engineer, Armstrong Cork Co., Lancaster, Pa. —"20 mm. Shell Tooling and Production;" J. F. Leland, manager, Metal Forming Div., Parker Rust-Proof Co., Detroit—"Tooling for Cold Steel Extrusion."

On Friday the morning session will be co-sponsored by the Los Angeles chapter of the American Society for Quality Control. General subject for the session will be "Quality Control Through Realistic Tolerances." Moderator will be William M. Ferguson, general manager, Quality Control Co., Los Angeles.

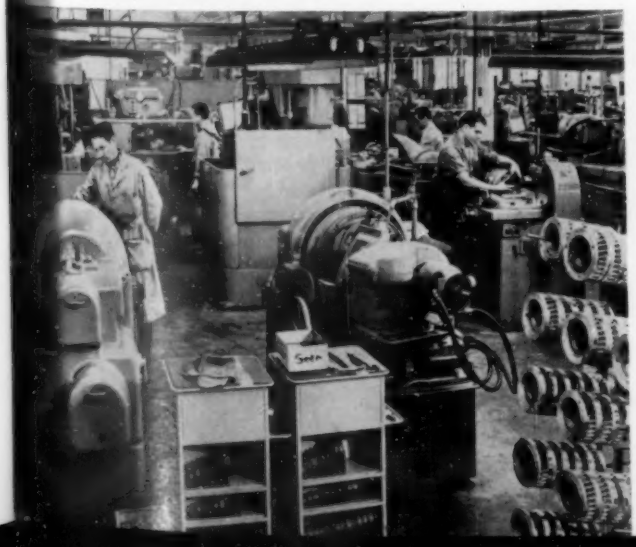
Speakers and their topics will be: E. E. Bates, assistant to director, Quality Control Div., Northrop Aircraft Co., Glendale—"Opening Tolerances for Closer Fitting Parts;" C. E. Deardorff, Bendix Aviation Corp.—"Size Tolerance vs. Positioning Tolerance;" R. F. Hurt, chief project planner, Lockheed Aircraft Corp.—"Converting Engineering Specifications Into Shop Practice;" F. H. Squires, quality manager, Lear, Inc., Los Angeles—"Who Inspects the Inspector?"; J. A. Broadston, armament engineer, Aerophysics Laboratory, North American Aviation, Inc.—"New Slants on Surface Roughness."

The final session of the week will be held Friday afternon at 2 o'clock. General subject for the meeting will be "Ferrous and Nonferrous Heat Treatment."

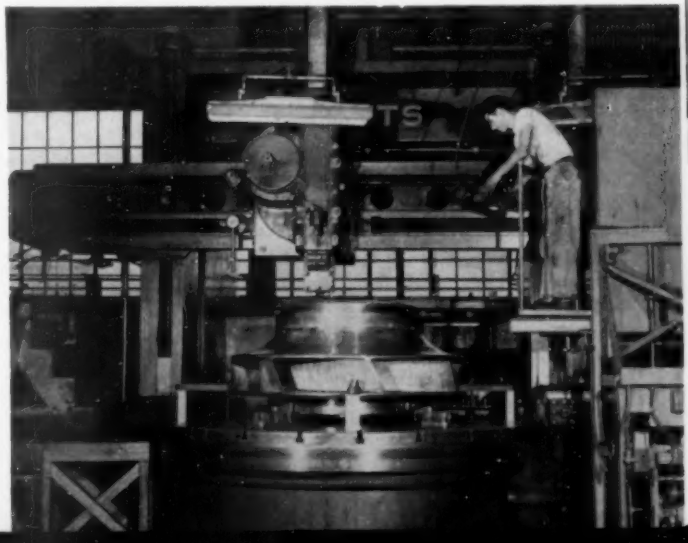
"Heat Treatment of Steels" will be discussed by A. V. Leubbers, Jr., chief metallurgist, and R. H. Lundquist, California-Doran Heat Treating Co., Los Angeles. "Aluminum Heat Treatment" will be discussed by Dr. George Perkins, general director, Products and Application Department, Reynolds Metals Co., Louisville, Ky.

AiResearch Manufacturing Co., div. of Garrett Corp., makes its own electric motors, which power electromechanical accessories manufactured for delivery in quantity to other aircraft builders.

McCulloch Motors Corp. makes its own die castings, carburetors, gears, and most other components for its products, which include fuel gages, superchargers, chain saws, and small motors.



Huge all-bronze impeller, below, is shown being machined in Betts vertical boring mill at Byron Jackson Co., which manufactures pumps, oil tools, submersible motors, and mechanical seals.



NEW NTDMA OFFICERS—Elected at the Dayton convention of the National Tool & Die Manufacturers' Association were, from left: Philip R. Marsilius, Bridgeport, Conn., treasurer; Joseph N. Huser, Indianapolis, first vice president; Jerome H. Stanek, Milwaukee, president; Herbert Harig, Chicago, second vice president; and Harold G. Murdock, Los Angeles, secretary. All officers, with the exception of Mr. Harig, are members of ASTE.

Fog Application of Cutting Fluids Studied by ASTE Research Fund Committee

Because of the widespread and increasing interest in the application of cutting fluids as a fog or mist and the dearth of factual information, the ASTE Research Fund Committee is sponsoring an investigation into such applications. Objectives of this research project are to determine the advantages and limitations of the method, obtain representative metal cutting performance data, outline fields for further study as indicated by the results of the project and explain indicated results in terms of current theories on fog application.

Initial phase of the project will be a survey of the literature covering uses of fogs as applied to cutting tools and bearings, and as used in heat transfer generally. Since valuable information has been published on each of these applications independently, it is assumed that a compilation of the known information will provide new keys to the physical, cooling and lubricating effects of mists and fogs.

Laboratory tests will be conducted in such a manner that the data obtained will be directly comparable to results obtained with more conventional methods of applying cutting fluids. Controlled variables in the investigation will be: workpiece material, cutting speed, depth of cut, tool material and configuration, and types of cutting fluids and additives used with continuous and intermittent cuts. Methods of, and equipment for, generating fogs will also be studied. Uncontrolled variables that will be measured include: tool life, workpiece surface finish, forces generated, temperatures induced and power required.

The current project resulted from a proposal by the Machine Tool and Metal Cutting Laboratories of Massachusetts Institute of Technology.

Trained personnel of the laboratories will perform the necessary investigations, follow through the analysis and prepare a report. Work will be under the guidance of a Research Fund steering committee comprising: F. E. Anderson, President, F. E. Anderson Oil Company, Inc.; R. B. Boswell, Research Dept., Engineering Div., Chrysler Corp.; W. E. Kramer, head, Industrial Engineering Div., Gulf Research & Development Co.; and Gordon Swardenski, assistant factory manager, Caterpillar Tractor Co.

Education Activities Receive Detroit Attention

Detroit chapter has again shown its active interest in the University of Michigan chapter by appropriating $150 for student sponsorship at the regional conference conducted on November 20 on the University of Michigan campus, Ann Arbor, Mich.

The Detroit chapter is also devoting some time to the proposed student chapter at Wayne University in Detroit. Officers of the chapter attended an organizational dinner meeting held in the Rackham Building with Professors Rivers and Churchill of Wayne, and Wayne students. Tony Panfil, educational section technical chairman, announced that the chapter will be ready for chartering by the Society in the near future. —*Walter Schober*

Powder Metallurgy Is Long Island Topic

"Powder Metallurgy" was the subject of the technical program held by the Long Island chapter on December 13 at the Garden City Hotel, Garden City, N. Y. Guest speaker was George Stern, vice president and technical director of American Electro Metal Corp., Yonkers, N. Y. He presented design information essential for use of powder metallurgy, including composition, densities, and physical properties of materials available and methods of production. Displays and slides augmented his talk.

On November 22, Long Island chapter met at Long Island Agricultural and Technical Institute for a panel discussion on "Setting Sensible Tolerances." The many factors that influence requirements to mass production limitations were discussed and a variety of solutions offered indicated that there was considerable room and need for improvement in obtaining an effective answer to the tolerance problem.

Panel members were: Neilson Tomlinson, of Republic Aviation Corp.; Lavern Whitlock, supervisor of quality assurance, Fairchild Engine and Aircraft Corp.; Arthur Zwanzig, chief engineer, American Electro Corp.; Giovanni Luzzatto, chief manufacturing engineer, Fairchild Camera and Instrument Corp.; and Stanley Gipp, quality control analyst, Sperry Gyroscope Co. Panel moderator was George McLaughlin, tool standards engineer, Grumman Aircraft Engineering Corp.

—*Jerome Barfus*

D. A. Schrom Promoted to Plant Superintendent

The Central Pennsylvania chapter is proud to announce the promotion of one of its members, David A. Schrom, to the position of plant superintendent of York Corp.'s Grantley plant. Mr. Schrom, a member of the National Editorial Committee, who had been shop superintendent at the plant, will supervise approximately 2000 production, engineering and supervisory employees in his new capacity. In addition to his ASTE activities, Mr. Schrom is an active member of the Professional Engineering Society and the University Club. He is a graduate of Pennsylvania State University.

—*Paul F. Leese*

"Acc[illegible] on Accuracy" Film [illegible]own at Portland

ASTE [illegible]bers of the Portland, Me., chapter [illegible]nding the December 10 meeting [illegible]d a talk by John C. Dixon, tool en[illegible] at Pratt & Whitney Div., Niles-Be[illegible]-Pond Co. and viewed a color fil[illegible] entitled "Accent on Accuracy."

Mr. Dixon reviewed the 90-year history of Pratt & Whitney in building machine tools and gages, and later conducted a question and answer period with Mr. Sherlock of the company's sales department. The film was devoted for the most part to jig boring and showed how the machines are made to the highest accuracy.

At the business portion of the meeting, a progress report on the apprentice-training program was presented by the education committee, which is looking forward to another successful examination and award meeting at Augusta, Me., this spring.

—Henery C. Hagman

Charles Staub Addresses Windsor ASTE Members

"Gear Production" was the program subject at the December 13 meeting of the Windsor chapter. Technical speaker was Charles Staub, consultant to the Michigan Tool Co., Detroit. The session was held at the Prince Edward Hotel and sponsored by D. M. Duncan Machinery Co., Ltd. Nearly 200 members and guests attended.

The annual nominating committee was chosen at this meeting. Serving this year are: David Heath, Robert Simpson and Jack Johnson. *—A. Underwood, Jr.*

IDENTIFICATION BADGE—Designed by the Hamilton District chapter, this ASTE membership badge is now being used for identification at all meetings of the chapter. It is molded of blue tenite plastic, highlighted with gold letters on raised portions. Information on cost and distribution may be obtained by writing A. S. Hurst, Atlas Steel Ltd., 195 Main Street, East, Hamilton, Ontario, Canada.

Natco Plant Visited by Richmond Members

Following their December 14 dinner meeting held at the Leland Hotel, 63 members and guests of the Richmond chapter adjourned to the National Automatic Tool Co. for a plant visitation. Rex Rench, personnel manager, and Ed Flook, sales representative, acted as hosts and ASTE members associated with the company acted as guides for the tour.

Small groups were taken through the entire plant to view the parts that go into the making of the various machines being built. The company makes processing machines, drillers, tappers and holeways. At the completion of the tour, each visitor was given a copy of "Drills and Drilling Practice."

Greater New York Host to ASTE Officers

Greater New York chapter held National Officers Night on December 13 at the New York Times Building, the meeting was attended by National President Joseph P. Crosby, Dr. Harry B. Osborn, Jr., national first vice president; and Richard A. Smith, a national director. The dinner session followed a reception in the Astor Hotel.

Technical guest speaker was Charles O. Herb, editor of *Machinery* magazine, who spoke on "Advancement of Machine Tools." Also on the program was Captain David Lambert, U.S.N., Naval Inspector of Ordnance, Long Island City, N. Y., who presented a movie on atomic weapons.

President Crosby said in his talk that investments of more than $100,000 per worker, for production tools, loom in the future.

"While the greatest challenges in history now face American industry," he further stated, "practically all leaders of industrial America are facing today's challenges with optimism. The demands of industrial automation, plus the need for 'instant preparedness' during the cold war, provide dual sources for the increased tooling cost per worker."

He also emphasized, "Challenges have always been stepping stones in industry's record of progress." He went on to say that because of the cold war, we not only have to increase peacetime production for ourselves and for the countries we are helping to keep out from behind the Iron Curtain, but we also have to keep our "moth-balled" defense production machinery up to date.

—Julius Shoen

Lima Members Receive Promotions

Two members of the Lima chapter were promoted recently. R. W. Arlin, chairman of the chapter finance committee, has been named supervisor of office mechanization at the Lima plant of Westinghouse Corp. A graduate of Purdue University, he has been with Westinghouse since 1946. His most recent assignment was supervisor of manufacturing engineering.

Donald F. Filter of Celina, master mechanic of New India Division of AVCO Manufacturing Corp., has been appointed chief industrial engineer. Mr. Filter, a graduate of the General Motors Institute, worked ten years for Cadillac Motor Co.

—Donald Cox

Our Thanks . . .

Since it's not possible for all of us here at ASTE to individually thank all of our friends for their Christmas greetings, we would like to take this opportunity to express our appreciation and thanks for the hundreds of wonderful cards received here at National Headquarters during the holiday season. It always gives everyone in the 'national family' and on the headquarters staff a very warm feeling to hear from so many friends from all parts of the world. We send our most sincere wishes to everyone for a peaceful and prosperous 1955.

Harry E. Conrad

Executive Secretary

"Cavitron" Demonstrated at Cincinnati Meeting

The use of the Sheffield "Cavitron" was the subject of a discussion held for 93 members and guests of the Cincinnati chapter on December 14. Ernest Pawley, sales engineer for Sheffield Corp. of Dayton, Ohio, illustrated the types of jobs which could be performed with his company's ultrasonic machine tool.

He brought out that the machine was capable of producing holes or slots as small as 0.012 in diameter and any tapered, curved or blind hole of almost any desired shape into hardened tool steel, natural and synthetic jewels, carbides, glass ceramics and so on.

At the business session the chapter elected its committee to nominate officers for 1955-56 term. The committee consists of Richard Niebusch, Joseph Aprile, Edmund Rontzong, W. J. Frederick and M. Albricht.

—Frank Houston

Titanium Discussed at South Bend Session

K. W. Stalker, supervisor of manufacturing development, Jet Engine Division of General Electric, was the technical speaker at the November 16 meeting of the South Bend chapter. He described characteristics of titanium when it is alloyed with different metals and told of his experience in machining titanium which is apt to present many production problems.

Orville Ashley was the recipient of the regular monthly prize. The meeting, held at Isaac Walton League club house, was attended by 80 members and guests.

—Dave Herring

WESTERN MICHIGAN EXHIBIT—Members and guests of Western Michigan chapters of ASTE and the American Society of Quality Control met at the Rowe Hotel in Grand Rapids on December 13 to see and hear the DoAll Company's presentation of "Civilization Through Tools." Pictured here, from left, are: Charles V. Bonczyk, chairman of the ASTE chapter; Frank Sweeney, president of the ASQC chapter; James R. Wagner, treasurer; C. G. Schelly, managing director of the Wilkie Foundation who narrated the exhibit; John S. Pridgeon, secretary; and Arthur J. Cook, first vice chairman.—*Jim Rost*

Hobby Night Held by Lehigh Valley Chapter

"Hobby Night" was enjoyed by 150 members and friends of Lehigh Valley chapter on December 10 when Al Carney of Carney Machinery Co. was host to the group in Allentown, Pa.

Factory-trained representatives were present to demonstrate and initiate the versatility of modern powered home or service tools and machines. Displays included the compact power unit known as "Shopsmith," the hobby and service machine made by De Walt, and Porter Cable's line of drills, sanders, routers and so on.

The meeting was quite different from the chapter's usual technical sessions in that it had the atmosphere of a hobbyist's hop with small groups here and there toying, questioning and manipulating and operating the shop tools. A buffet luncheon was served to the group following the meeting. *—Paul Gehris*

LEHIGH HOBBY NIGHT—Identifiable in the group watching a demonstration by a DeWalt representative at Lehigh Valley's "Hobby Night" are: far right, Al Carney of Carney Machinery; he was host for the chapter's meeting; Werner O. Miller, Lehigh chairman to Mr. Carney's right; and Ralph Mueller, first vice chairman, on the far left.

Madison Chapter Holds Fall Festival Party

Technical phases of an ASTE meeting were replaced at Madison's November session by the chapter's fall festival party. Held at the Club Chanticleer, the annual event was attended by 70 members and wives. Dinner preceded the evening's entertainment with square dancing and modern dancing to the music of Fritz Erb. A variety of games, with prizes going to the winners, rounded out the program.

—Lyding A. Havey

Battle Creek Members Discuss Welded Joints

The subject of the December 13 meeting of the Battle Creek chapter was "Welded Joints." Some 58 members and guests heard a talk by John Borman, assistant to the vice president of Clark Equipment Co., Battle Creek, Mich.

He gave a demonstration by bending plastic and using the photoelastic process to show high stress concentration area in welded joints. He also pointed out ways of eliminating it and the notch effect that occurs.

Charles Tansley received a free dinner ticket for the next meeeting and Fred Hicks got a pocket slide rule donated by Professional Design Service, Inc. *—Arthur F. Damon*

C. F. Hautau Passes Michigan Engineering Exam

Charles F. Hautau, chief engineer at Hautau Engineering Co., Ferndale, Michigan, recently passed the state examination for becoming a registered professional engineer. He is a member of the Detroit chapter of the Society.

Rochester Speaker Talks on Ultrasonic Machining

New processes developed by Sheffield Corp. for machining of hard metals, carbides and nonmagnetic substances such as glass, porcelain, quartz, and germanium, were explained by George C. Brown, sales engineer for the company, at the December 6 meeting of Rochester chapter. Slides illustrated his discussion.

A special highlight of the meeting was the presentation of four life memberships in the chapter to members meeting the qualifications set up by the executive committee. That group resolved recently that all past chairmen of the chapter who reach the age of 65 and are members in good standing shall automatically be made life members of the Rochester chapter, with dues to be paid out of the treasury. Any other members in good standing at the age of 65 may be elected to the life-member status by a vote of the executive committee.

—Paul A. Bruno

Canton Chapter Tours Roller Bearing Company

Members of the Canton chapter, numbering 88, toured the Timken Roller Bearing Co. in Canton, Ohio, on November 18. The group was welcomed to the plant by its host, H. J. Urbach, executive chief engineer of the company. Members saw the steel mill operation from the melt shop through the tube mill, as well as the bearing plant including heat treating, finishing and inspection operations.

H. J. Urbach

—Gene Hornbeck

Turning Discussed at Hendrick Hudson Meeting

S. A. Brandenburg of the Monarch Machine Tool Co., Sidney, Ohio, was the guest speaker at the December 15 meeting of the Hendrick Hudson chapter. Some eighty members and guests were present for the program held at the Circle Inn, Latham, New York.

Mr. Brandenburg showed two excellent color films in connection with his talk on "The Latest Development in the Turning Field." A brisk discussion period attested to the interest in the program.

—James G. Kierman

ROCHESTER LIFE MEMBERSHIP—Charles Codd, right, oldest ASTE member and a past chairman at Rochester, receives his life membership in the chapter from Chairman Gerald Sick. Other life memberships were given to John Dense, Emmett Moore and William Gordon.

Talks on Welding Given at San Gabriel Valley

"Eutectic Welding of Tools" was the title of a program presented November 4 before an audience of 130 San Gabriel Valley members and guests. Speakers were Robert Welch and Joe Martin of the Eutectic Welding Alloys Corp.

Six prizes awarded during the meeting, including a *Tool Engineers Handbook*, pen and pencil set, desk list finder, auto visor pad, address book, and soft drink cold pack, were given to: Nils Seagrens, Wayne Miller, Clarence LaCourse, Don Carter, Ted Monroe and Don Brannen. The free dinner award was presented to M. G. Barker.

—Joe Wajdik

University of Houston Plans ASTE Conference

The University of Houston in cooperation with the Houston ASTE chapter will present its first on-campus conference next spring on April 22-23. The theme of the conference will be "Increased Profit Through Increased Production."

The two-day program is scheduled to include tours of the college engineering laboratories; speakers such as H. Dale Long, assistant secretary-treasurer of ASTE and president of Scully-Jones & Co.; Malcolm F. Judkins of Firth-Sterling; and S. A. Brandenburg of Monarch Machine Tool Co. A complete schedule of ladies' activities is also being arranged for the conference.

Mr. Judkins plans to talk on "Design and Application of Carbide Cutting Tools" and Mr. Brandenburg has picked as his subject matter "Fundamental Design Requirements for Controls for Machine Tools."

—Virgil Ferguson and Homer Briggs

Michigan Tool Co. Announces Changes

Appointment of A. D. Moncrieff as manager of the machine tool and cutting tool divisions and Clayton E. Scott as chief engineer for Michigan Tool Co. has been announced by Oscar M. Bard, president. At the same time, it was announced that Charles R. Staub, chief engineer since 1936, has been named staff consultant. Both Mr. Staub and Mr. Moncrieff are members of the Detroit ASTE chapter.

NATIONAL MEMBERSHIP COMMITTEE—A recent meeting held at ASTE national headquarters in Detroit provided the opportunity for a 'family portrait' of members of the National Membership Committee. Participating in the session, seated from left, were: Harry E. Conrad, executive secretary of the Society; William Schug, chairman of the committee; Andrew Clark, member of the Board of Directors; Lawrence Cook; Marvin Bunting, staff administrator; and Emanuel Lull. Standing: Frank Flannery, Carl Kertesz, Carl Hoffman, Louis Slager, Irving Byro; Verne Loeppert, Orville Strahm and Errol Porter.

Taps Discussed at Fort Wayne Meeting

Members and guests of the Fort Wayne chapter met at the Chamber of Commerce on December 8 to hear a discussion on "Taps and Tapping Problems" by Leonard Rice. Mr. Rice is sales engineer for Threadwell Tap and Die Co. of Greenfield, Mass. His talk was followed by the film, "Tap Manufacture and Application."

The coffee speaker was Kenneth E. Newendoop who has a program called "Weather Man" on the local television station WKJG-TV. His topic was "Changing Climate."

Another highlight of the program was the film, "The Pan-American Road Race." The meeting attracted a crowd of 80 and the chapter gives credit for the good attendance to John B. Thimlar, public relations committee chairman for the chapter, who sent out special bulletins to the local manufacturers. Joseph A. Deck planned the successful program.

On December 4, Fort Wayne chapter held its annual Family Christmas Party. Richard W. Good, second vice chairman, was in charge of the event. Festive doings included turkey dinner, music, a minstrel show and individual gifts for the kiddies.—*Robert H. Bienz*

New Testing Tools Discussed at Schenectady

Technical speaker at Schenectady's December meeting was Francis G. Tatnall, manager of research for the Baldwin-Lima-Hamilton Corp. In his talk on "New Testing Tools and Methods," Mr. Tatnall described the many applications of bonded wire strain gages in industrial testing for tension, compression, and torque. He also told of the services performed by the devices.

Amos Kraybill Retires

Amos Kraybill, a member of the Greater Lancaster chapter, who is 67, has retired from the Bearings Company of America. He has the longest service record with that company, having started in 1913 when the company was known as Sterling Metal Products before it merged with Star Ball Retainer to become Bearings Company of America.

Starting as a draftsman, Mr. Kraybill also served as acting assistant to the superintendent, supervisor of drafting and tool engineer, the position he held upon retirement. Mr. Kraybill, long active in Greater Lancaster chapter, was the chapter's first delegate.

—*George Gallagher*

Accountant Addresses Santa Clara Chapter

Wesley Taft Benson, certified public accountant, was the speaker at Santa Clara Valley's December meeting. His topic was "How to Make Money by Proper Use of Accounting." Guests included George Gayer and Richard Gieseker. —*Harold T. Weaver*

Roger Waindle Guest of Boston ASTE Chapter

Roger F. Waindle, immediate past president of ASTE, was the special guest of the Boston chapter at its December 9 meeting. Some 120 members and guests turned out for the event at the New England Mutual Hall.

Guest speaker was Ralph L. Mondano, research staff member of the Raytheon Manufacturing Co., Waltham, Mass. Mr. Mondano spoke on "Plastics and the Tool Engineer," bringing out the advantages of plastic tooling and citing ease of handling and storing. A demonstration was put on, showing how a drill jig would be made out of plastic impregnated glass cloth on a piece with compound curves.

Charles Moody, an instructor at Wentworth Institute, was awarded a *Tool Engineers Handbook* for bringing the most new members into the chapter. The nominating committee was also selected and it consists of W. B. Wells, J. B. Savitts and A. J. Leonie.

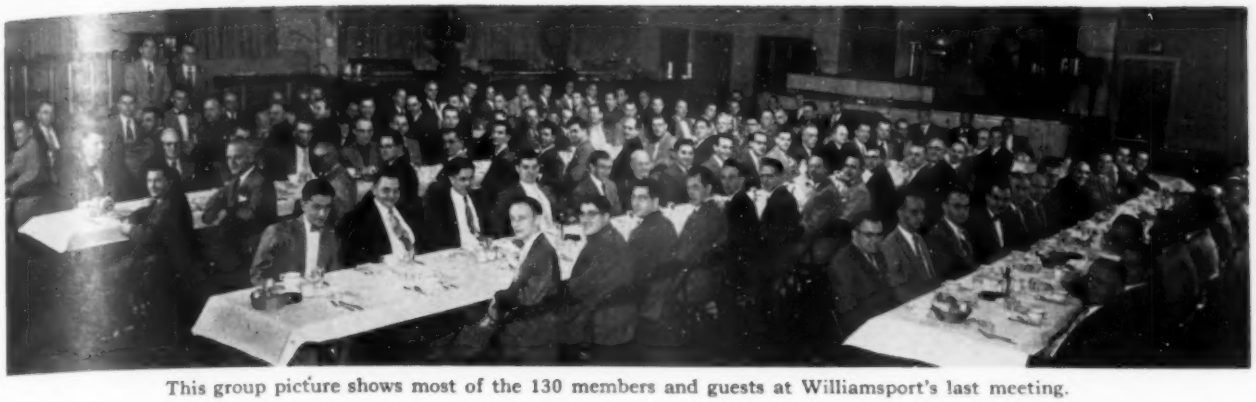
—*Eva P. Castelli*

Atlanta Engineers Discuss Low-Melt Metals

"What Do Low-Melt Metals Mean to Tool Engineers" was the subject of a talk given by O. J. Seeds before 65 members and guests of the Atlanta ASTE and ASM chapters. Mr. Seeds, sales manager of Cerro de Pasco Corp., presented applications of low melting temperature metals, using slides to illustrate his talk.

Two ASTE chapter members, George Williams and Lawrence McDowell, demonstrated a tool for winding all types of compression and tension springs, which they had developed. Both are senior tool engineers at Lockheed Aircraft Corp. —*John F. Morris*

FORT WAYNE PROGRAM—John Thimlar, public relations chairman and Leonard Rice, technical speaker, review highlights of a successful program, on the left. The right-hand picture shows Chairman Charles A. Haughk, right, thanking Kenneth Newendoop for his coffee talk on "Changing Climate." At left is Alfred E. Patterson, chapter membership chairman.



This group picture shows most of the 130 members and guests at Williamsport's last meeting.

Williamsport Members Hear Stanley J. Gartner

A talk on "The Automaton of a Machine and Its Problems of Design, Construction and Development" was given December 13 for 130 members of the Williamsport chapter. Speaking to the group was Stanley J. Gartner, chief design engineer at the equipment development plant, Radio Tube Division of Sylvania Electric Products Inc.

Introduced by Harry Featherstone, Mr. Gartner's discussion was illustrated by slides of various stages of machine development and high-speed movies of machines in actual operation.

Guests attending the meeting included the following managers of various Sylvania plants: S. George Lawson, Herman Melzer, Fred Atwood, Orville Jensen, and Michael Balog.

—Philip F. Lynn

Evansville Holds Annual Ladies' Night

Evansville chapter held its annual ladies' night on December 13 at the Hadi Temple and some 135 members, guests and their wives were on hand for the event.

Guest speaker on the program was Mahmut Esat Ozan of the Rural Electrification Membership Co-operative, Washington, Indiana. Mr. Ozan who came to Indiana as a student in 1947, and studied successively at Indiana University, Vincennes University and Evansville College, spoke on "Customs and Ways of our Allies, the Turks." Having returned from his native Turkey recently, where he was part of the U. S. Agricultural Aid Mission, he is planning to become a U. S. citizen.

Mr. Ozan emphasized that Turkey was the staunchest ally that the United States has, since she got U. S. military and economic assistance. He showed colored slides of the Turkish countryside, gathered on his recent trip.

—Guenther F. Wulf

Program on Broaching Given at Springfield

Presented for 130 members and guests of the Springfield, Mass., chapter at the December meeting was a talk on broaching by J. F. Whittington of the Cincinnati Milling Machine Co. During his informative lecture, Mr. Whittington showed many slides of various broaching machines. He was introduced to the chapter by Richard S. Brown, who was technical chairman for the evening. Also on the program was a film produced for Latrobe Steel Co. entitled "The Heart of the Matter."

The technical session was held at the Springfield Turnverein. The 'supper club' met before the meeting at the Student Prince Restaurant.

—George H. Foy, Jr.

ROCKFORD PROGRAM—Presented at the November 11 meeting held at the Lafayette Hotel was a talk on ultrasonic machining of hard metals by J. T. Welch, center, manager of the Ultrasonic Machining Div., Sheffield Corp. A film on the manufacture of bearings was shown by W. E. Smart, left, for Fafnir Bearing Co. Mr. Welch also gave a brief review of the business conditions he observed on a recent trip to Europe. Close to 100 members and guests attended the session—*Les Teachout*

Holiday Parties

Chautauqua-Warren's second annual Christmas dinner-dance was held December 18 at the Crystal Ballroom of the Hotel Jamestown in New York. Turkey dinner, carol singing, dancing and corsages for the ladies were all a part of the enjoyable evening. From left are: Leslie H. BeauJean, editorial committee chairman; Herbert Cave, chapter chairman; and the co-chairman of the dinner-dance committee Anthony DeMambro and Robert M. Putnam.

—Leslie H. BeauJean

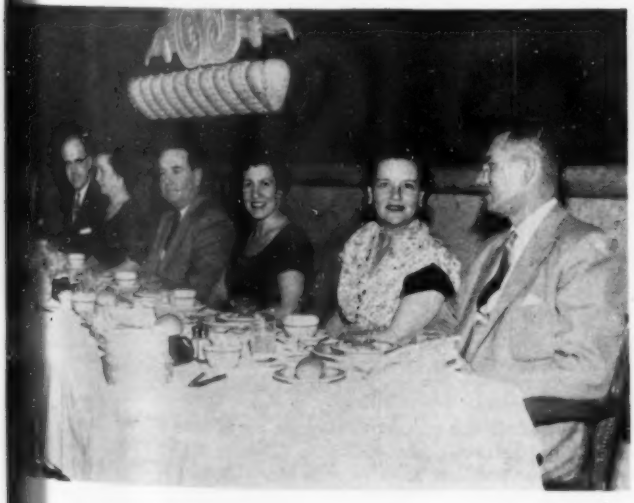
Calumet Area's December 10 ladies' night was highlighted by dinner, corsages, a vocal duet and a film entitled "Steel, the Servant of Man." Among those present included, from left: Mr. and Mrs. Thomas C. Barber, chairman of the National Program Committee; Mr. and Mrs. Edward Dickett; Mr. and Mrs. David MacGregor; Mr. and Mrs. Cecil Chapman; and Mr. and Mrs. Leslie Thill. Mr. Thill is Calumet Area chairman.

—L. W. Montgomery

Amato's Supper Club was the scene of Portland, Ore., chapter's annual Christmas party. Members and their wives had buffet supper in a private dining room with sound piped in from the main floor and stage. The Mills Brothers were the star attraction of the floor show viewed by some 50 ASTE merry-makers.

Holiday celebrators who attended the Little Rhody chapter's annual Christmas party, are seen at the head table. A gay time was had by all at Johnson's Hummocks Restaurant with dinner music and entertainment by a professional "pick-pocket."

—William T. Nystrom



Racine chapter's December dinner-dance was attended by 120 members, wives and friends at the Meadowbrook Country Club. The women received costume jewelry and the evening was topped off by Danish style smorgasbord.

PORTLAND, ORE., PARTY—Chapter officers and committee chairmen pictured at the annual Christmas party, from left, are: Fred Allen, first vice chairman, Fred L. Mondin, chairman; Robert C. Erickson, treasurer; Andy J. Winters, second vice chairman; Robert D. Stone, secretary; Daniel Melody, co-chairman of the membership committee; and Walter L. Brenneke, editorial and public relations chairman.

—Walter L. Brenneke

Social Events Highlight Holiday Season

The month of December is traditionally one of social gatherings in the holiday spirit for ASTE chapters. Program planning is done in a lighter vein with emphasis on ladies nights, family Christmas parties and dinner dances.

In **Detroit** nearly 1000 members, wives and friends met at the Latin Quarter on December 9 for the chapter's annual Christmas party. Walter Schober reports that it was one of the best ever held. "Rinee" Schulz and Leonard Joseph were responsible for the planning of the event.

Fairfield County chapter held its party at Eichner's Restaurant on December 1 with dinner and dancing and entertainment. Some 45 members and wives were on hand for the festivities, according to Henry E. Busby, Editorial chairman.

Fox River Valley chapter's annual ladies' night was attended by some 86 members. The VFW Home of St. Charles, Illinois, was the setting for the affair. Chairman Donald Zierck, welcomed everyone and introduced Gibby Babcock who served as MC for the evening program. A smorgasbord dinner was served and enhanced by organ accompaniment. Entertainment was via a singing and dancing troup and the evening was concluded by Dave Bennett and his orchestra for dancing, according to Robert J. Evans, second vice chairman of the chapter.

Lima chapter's annual ladies night was held in the Royal Pine Room on December 4, according to a report by Donald Cox and Donald Sarber. Members and their wives dined on shrimp cocktail and filet mignon, and danced to the music of Hank Armantrout and his combo. The wives received corsages and the men were given boutonnieres. Evening entertainment was provided by Mickey Manners of the Century Club. Credit goes to R. E. Fromson, chapter chairman; R. T. Mercer, program chairman; and Richard E. Shaw, master of ceremonies, for a memorable evening.

Basil Boss, editorial chairman of the **Los Alamos** chapter, reports that his chapter held its annual holiday dinner-dance on December 3. A buffet dinner was served from seven until nine and the members and their wives, numbering 65, danced from nine to one. Besides being the social event of the season for the chapter, the dinner-dance is a fund raising program. Each Christmas all children of ASTE members are paid a personal visit by Santa Claus. "Santa Claus" is three chapter members who make the rounds several nights before Christmas. It usually takes only two or three nights. Santa Claus also goes to the local hospital to reassure the boys and girls he won't forget them.

Muncie's annual ladies' night and Christmas party was held at the Green Hills Country Club on December 11. According to Darrell Marks, chapter editorial chairman, 83 members and their wives were on hand for the event. Speaker was Ken Griffin of Purdue University, an English professor. Technical subjects were laid aside for dinner, dinner music on the Hammond by Delmar Dooley, and dancing to the music of the Gruwell Band.

Forest Hills Country Club was the scene of the **Rockford** chapter's December 9 annual dinner-dance. Attendance numbered 270, according to Les Teachout, chapter editorial chairman. Dinner, dancing and entertainment were the ingredients of the evening. On the program were Bob McElroy, ventriloquist, and Eddie Jacobi and his trio played for the dancers.

Tri-Cities chapter celebrated its annual ladies' night at Johnnie Hartman Restaurant in Davenport, Iowa, according to Clifford C. Vogt, editorial chairman. Approximately 350 members and wives dined on filet mignon, and were provided dinner music by "Marge" Meinert, local TV organist. A 30-minute program of various acts followed dinner and most of the artists were from WOC-TV of Davenport. The evening concluded with dancing.

Named Vice President of National Twist Drill

Howard McGregor, Jr., president of National Twist Drill & Tool Co., Rochester, Mich. has announced that Carl J. Oxford, formerly chief engineer and a director of the company, is now vice president in charge of engineering. Mr. Oxford is prominently identified with metalworking societies, notably ASTE, Metal Cutting Tool Institute, and American Ordnance Association, as an author of technical articles and as a speaker.

LOS ANGELES PARTY—Pictured at the annual Christmas party held at the Deauville Club at Santa Monica, from left, are: Mr. and Mrs. Charles E. Schewer, Mrs. Oliver Smith and Mr. Smith; Mrs. William Hughes and Mr. Hughes; Miss Patricia Phyle, and William J. Trenitwick.

ST. LOUIS PROGRAM—First vice chairman Harold Zimmerman examines the "FuturMill" with Detroit Milling Cutter Co. president H. E. Beagle, second from left, as Floyd Scamon, development engineer for the firm and principal speaker, explains the "Loadmeter" to Irwin Schumbier, chapter chairman, and Dave Green, of A. B. Chance Co. More than 100 St. Louis members were on hand at the DeSoto Hotel for the session on "Overloading Devices as Applied to Tooling Problems." —*Bert Igou*

December Is Busy Month for Racine ASTE Members

In addition to the chapter's Christmas party, Racine members participated in two technical programs during December. The first one, held on December 6, featured a talk on "Helping Yourself to Production Economies," made by Joseph Kosinski, works manager for Scully-Jones & Co., Chicago.

He covered the importance of applying the right production methods and the revision of obsolete methods for metalworking economies. Various case histories of cutoff saws, tracer equipment for lathes, carbides, grinding of carbides, and types and effects of coolants were illustrated with slides.

A highlight of the meeting was the first displaying of the chapter's new ASTE banner, and the introduction of a large group of new members by membership chairman Charles Nelson.

On December 16 the chapter visited the new Oak Creek Power Plant of the Wisconsin Electric Power Co. About 50 members were guests of Robert Swift, Racine manager for the company. —*Alvin J. Michna*

Fred J. Cowell Named Chrysler Factory Manager

Promotion of Fred J. Cowell, member of the Windsor ASTE chapter, to the newly created position of factory manager, engine plant, has been announced by Kenneth Crittenden, vice president and operating manager, Chrysler Corp. of Canada, Ltd. Mr. Cowell has been associated with the automobile industry for the past 34 years and since May of last year has been superintendent of the Chrysler of Canada engine plant. Born in England, Mr. Cowell came to Canada as a child and started work in 1915 as an apprentice machinist. He joined Chrysler in 1937 as foreman of the crankshaft department, becoming successively general foreman, production superintendent and division superintendent. In 1948 he was promoted to assistant plant superintendent of the engine plant and three years later to assistant general plant superintendent.

Erie Chapter Tours Pennsylvania Plant

On December 7, members and guests of the Erie chapter, numbering 46, toured the National Bearing Division of American Brake Shoe Co. in Meadville, Pa. The group met in the plant cafeteria for steak dinner where Charles Ban, plant superintendent, gave a short talk on the plant operations and products.

The group was then split up into smaller groups and they were escorted through the plant.

—*Samuel A. Fiorenzo*

Film Viewed by Members at New Orleans Meeting

A film on the Pacific hydraulic press brake, sponsored by Dixie Mill Supply Co., was shown at the technical meeting held November 9 by the New Orleans chapter. The dinner session was held at Frank's Steak House. —*Joseph Natal*

George Popham Elected President of Gorham Tool Co.

A member of the Detroit chapter of ASTE, George N. Popham has been elected president and general manager of Gorham Tool Co., Detroit. Formerly vice president and sales manager, Mr. Popham succeeds Don T. Flater who resigned to devote full time to other business interests.

SAN FERNANDO LADIES' NIGHT—Among the guests at the December meeting, seated from left, were: Mrs. Art Lewis, Mrs. Rudy Regen, Mrs. Tommy Tomlinson, and Mrs. Griffin. Standing: Mr. Lewis, past chairman; Mr. Coulter, guest from San Francisco; Ralph Chrissie, of Los Angeles chapter and a member of the National Program Committee; Mr. Regen, national delegate; Mr. Tomlinson, chairman of the entertainment committee; and Mr. Griffin, first vice chairman. The evening's program at Hody's Restaurant included dinner, dancing and an informal talk by Don L. Davis, president of the National Gadget Manufacturers' Association.—*A. J. Soares.*

NORTHERN NEW JERSEY PRESENTATION—Malcolm F. Judkins, third from left, receives the first honorary membership in the New Jersey chapter of the Society of Carbide Engineers from Michael W. Maloney, second from left, chairman of the organization. The presentation was made at the December 7 meeting of the Northern New Jersey ASTE chapter where Mr. Judkins, chief engineer of the High Temperature Alloy Division of Firth-Sterling, Inc., was the featured speaker. His discussion on new products and metals pertaining to high-temperature alloys and carbides was heard by 175 members and guests.—*Walter Wunderlich*

Milwaukee Chapter Visits Wisconsin Motor Corp.

More than 165 members and guests of the Milwaukee chapter participated in the December 9 tour of the Wisconsin Motor Corp. After dinner, served at the plant cafeteria, guides were assigned to groups of 15 members and the tour began at the receiving room where rough castings and forgings are stored.

The visitors were shown the complete machining of cylinder, crankcase and cylinder heads; the turning, heat treating and grinding of crankshafts, connecting rods, piston flywheels; and the final assembly and testing of completed motors. Catalogs were given to all members taking part in the tour.

—*Walter Behrend*

Niagara District Learns About Adjustable Drives

Technical speaker at Niagara District's December meeting was A. Ludlum of Reliance Electric & Engineering, Ltd., Welland, Ont. His subject, "Adjustable Drives in Industry," concerned the electrical variable speed types derived from control of d-c motors.

He illustrated his lecture with sketches showing how simple it is to control equipment by the proper electrical circuits. By using the electrical variable speed drives, manufacturers of lathes, planers, shapers, conveyors, printing machinery, and coil winders have been able to minimize the gearing required, due to the tremendous speed range of the d-c motor.

—*William A. Yaeger*

Good Guides for Examination Study

Two booklets which have proven highly useful in studying for professional engineering examinations have again been made available to members of ASTE. They are: "Past Engineer-in-Training Examinations, State of California," covering all past E.I.T. examinations from Fall 1949 through May 1954, and "Past Examinations for Professional Engineer, Mechanical, State of California," which covered exams from Fall 1949 through December 1953.

Both are offered by Vernon Gallichotte, member of the National Professional Engineering Committee. Each is one dollar and may be obtained by writing to: V. H. Gallichotte, 3531 Emerson St., Palo Alto, Calif.

John Myers Speaks to Baltimore Members

At the December 1 meeting of the Baltimore chapter some 70 members and guests heard a presentation by John Myers of Esskay-Schulderberg, Kurdle Co. of Baltimore, Md. He showed a film on "The Meat-packing Industry."

Also on the program, Paul E. Burke, executive director of Maryland State Safety Commission, and Sgt. Hugh Cavanagh, of the State Police.

—*Neil Heller*

Tooling Is Topic at Twin Cities Meeting

The president of General Alloys, Boston, Mass., H. H. Harris, was the featured speaker at the December 1 meeting of the Twin Cities chapter. Discussing the subject "High Temperature Tooling," Mr. Harris stressed the many things a young man must learn in order to become a first class tool engineer. He also emphasized the need for continued study due to the rapidly broadening scope of engineering and the new discoveries which step up the tempo almost daily. Nearly 100 members and guests attended the session.

—*Walter J. Comstock*

AWARD WINNERS—Winners of Twin Cities scholarship awards of $100 each are, from left: Gerald Ogren, St. Paul Vocational School; Roger Easthouse, Dunwoody Industrial Institute; and Donald Porter, University of Minnesota. The award given annually to a University of Minnesota study is known as the Louis Walter Scholarship in honor of the late chapter member.

Long Island Member Eric Preece Dies

Eric Preece, one of the organizers of the Long Island ASTE chapter and a former member of the Northern New Jersey chapter, died on December 31 at the age of 56. At the time of his death he was works manager for the Fairchild Engine & Airplane Corp., Farmingdale, N. Y.

Born in Alesbury, England, Mr. Preese received much of his education at schools in Scotland, including the Glasgow Technical Institute. Upon coming to the United States in 1926, he joined the Ford Motor Co. as tool room foreman and studied engineering subjects at technical schools in Detroit. He later took evening courses at the University of Buffalo.

Mr. Preece became a member of the Society in 1938 when he was with Wright Aeronautical Corp., Paterson, N. J., as supervisor in charge of experimental methods. He had previously been associated with Colonial Radio Co.

Automation Topic of Des Moines Meeting

A timely discussion of cost reduction through automation was presented by Glen A. Hier, chief estimating engineer of the Barth Corp., Cleveland, before an audience of 50 Des Moines chapter members and guests on November 17. He spoke of the method of approach to automation and the limitations of automation.

Mr. Hier also showed a film illustrating both single purpose automation in the assembly of seal beam headlights and multipurpose automation in the fabrication of electric motor components.

A "gimmick session" consisted of a film shown by J. G. Scanland of New Monarch Machine and Stamping Co. on rocket fin assembly.

—J. J. Schlesselman and Q. Quinn

A. O. Schmidt Speaks at Pennsylvania Meeting

Guest speaker at Central Pennsylvania chapter's December 1 meeting was A. O. Schmidt, research engineer for Kearney and Trecker Corp. of Milwaukee. Fifty-four members and guests were on hand for the meeting at the West York Inn. "Carbide Milling" was the topic of Mr. Schmidt's talk and he augmented the presentation with slides showing the damage and poor finish from the use of improper tools and dull ones.

Special guests of the chapter were the general manager and superintendent of The Brubaker Tool Corp., James Armour and L. E. Shipman. The chapter was especially proud to have them since their visit involved a trip of 112 miles.

—Paul F. Leese

Optical Projection Is Topic at Twin States

An audience of 70 Twin States members and guests was an hand to hear the technical discussion of "Inspection by Optical Projection Methods" by Edward C. Polidor, vice president and general manager of Optical Gaging Products, Inc. The program also included a film produced for the Ford Motor Co., entitled "Tomorrow Meets Today."

New members introduced at the meeting were: Norman Viehrman, Ronald Eigenbrod, and Harold Sample. The dinner session was held at the Trade Winds Cafe.

—J. Clark

Greeting Edward C. Polidor, right, to the Twin States chapter meeting is chapter chairman Martin Parker.

Hamilton Holds Past Chairmen's Night

Some 65 members and guests of the Hamilton chapter were on hand for the December 10 meeting which was past chairmen's night. The event was celebrated with a pre-Christmas dinner.

Guest speaker on the evening program was B. G. MacKenzie, sales manager for Delora Smelting and Refining Co., Ltd., of Delora, Ontario.

Mr. MacKenzie spoke on "Precision Investment Casting" explaining the process with the use of wax or plastic expendable cores and refractory castings. He also brought out the shrinkage allowances required and the economic aspects of the process.

—G. W. Hawkes

Appointments Announced for Research Committee

Six additional members have been named to the metal cutting steering committee of the ASTE Research Fund Committee. First announcement of the metal cutting project was made in the January issue of THE TOOL ENGINEER.

Appointed to the steering committee are: Fred Boynton, Reynolds Metals Co., Louisville, Ky.; Dr. Hans Ernst, director of research, The Cincinnati Milling Machine Co.; Dr. W. W. Gilbert, manufacturing research and development service department, General Electric Co., Schenectady, N. Y.; Dr. William T. Lankford, chief research engineer, Specialty Products, United States Steel Corp., Pittsburgh, Pa.; George Pascoe, manager, design and standards department; Manufacturing Engineering Office, Ford Motor Co., Dearborn, Mich.; and Earle C. Smith, chief metallurgist, Republic Steel Corp., Cleveland, O.

Films on Ball Bearings Shown by Donald Amidon

At a meeting of 115 members and guests of the Northern Massachusetts chapter, Donald Amidon, sales engineer for SKF Industries of Hartford, Conn., presented a program on ball bearings. Three sound films pictured bearing parts and nomenclature, care of bearing, and applications.

In addition a number of interesting cutaway samples were on display.

NORTHERN MASSACHUSETTS SPEAKER—A vital message on "Why the Stress on Human Relations for Engineers?" was presented by Frank Zacher, standing, director of personnel, Norton Co., at the executive-educational night sponsored recently by the Northern Massachusetts ASTE chapter. Author of numerous articles on personnel and co-author of the book *Business Communications*, Mr. Zacher is past president of the Worcester, Mass., Personnel Directors Council and is a former member of the faculty of Boston University. Pictured with him, from left are: Richard A. Smith, national director of ASTE; George A. Stanley, chapter education chairman; and Senator Elizabeth Stanton, Fitchburg, Mass.—*Otto S. Nau*

coming ASTE meetings

On-Campus Conferences

PURDUE UNIVERSITY—April 22, 23, West Lafayette, Ind.

UNIVERSITY OF HOUSTON—April 22, 23, Houston, Texas.

UNIVERSITY OF TENNESSEE—May 6, 7, Knoxville, Tenn.

Chapter Meetings

BOSTON—Feb. 10, 6:30 p.m., New England Mutual Hall. Demonstration of ATTC transitors by New England Telephone and Telegraph Co.

CEDAR RAPIDS — Feb. 10. Nomination and election of officers. "ServoMechanisms" by Ed Hulla of Westinghouse.

CENTRAL PENNSYLVANIA—Feb. 1. National Officer and Chief Executive Night. Joseph P. Crosby, national ASTE president, will speak.

CHAUTAUQUA-WARREN—Feb. 17, Jamestown. Election of officers. "Die Making and Tool and Die Makers Apprentice Training" by representatives of the Danly Co.

CLEVELAND—Feb. 11. Election of officers. "Machining, Welding and Fabrication of Titanium" by a representative of Mallory-Sharon Titanium Corp.

COLUMBUS—Feb. 9. Election of officers. "Industrial Safety" by speaker from Ohio State University.

DETROIT—Feb. 3, 8 p.m., Junior Rackham Building. "Grinding of Carbides." Feb. 10, 6:30 p.m., Rackham Memorial Auditorium. "Hydraulics vs. Mechanical. Feb. 17, 7:30 p.m., Junior monthly meeting. "Grinding as a Manufacturing Process Today," by Kenneth L. Bates, of Grinding Service Section of Research Development Dept., Norton Grinding Co.

ERIE—Feb. 1, 6:30 p.m., G. E. Community Center. Election night.

GOLDEN GATE—Feb. 16. "Industrial Diamonds" by Mr. Strauss.

GRANITE STATE—Feb. 15, 7 p.m., Somersworth, N. H. Hotel. "Machining of Small Precision Parts" by N. Kenneth Perkins of International Business Machines Corp.

HAMILTON — Feb. 11, Fisher Hotel. "Press Brake Tooling" by Fred Brodley.

HARTFORD—Feb. 7. Election of officers and plant visitation.

HENDRICK HUDSON—Feb. 16. "Production Tooling Problems" by Harry Conn, chief engineer, Scully-Jones & Co. Election of officers.

LA CROSSE—Feb. 22. "Operation Push-Button" by J. James Mudd.

LEHIGH VALLEY—Feb. 18, 8 p.m., Hotel Traylor, Allentown, Pa. "Civilization Through Tools" by C. G. Shelley, managing-director of the Wilkie Foundation, the DoAll Co.

LIMA—Feb. 17, 6:30 p.m., Royal Pine Room. "Presses and Latest Developments in Press Work" by Norman Dunlap, director of sales, Minster Machine Co.

LONDON-ST. THOMAS—Feb. 17. "Tool Salvage" by Al Trueman of General Motors Diesel.

LONG ISLAND—Feb. 14, 8:30 p.m., Garden City Hotel, Garden City, N. Y. "Operation Push-Button" by a representative of The Bellows Co.

LOUIS JOLIET — Feb. 15, 6:30 p.m., Woodruff Hotel. Election of officers.

MONTREAL—Feb. 16. "Latest Developments in Thread and Tap Design" by a representative of Greenfield Tap & Die Co.

NEW HAVEN — Feb. 10. "Supersonic Turning" by a representative of Jones & Lamson.

NORTHERN NEW JERSEY—Feb. 8, 8 p.m., Hotel Robert Treat, Newark, N.J. Election of officers.

NORTHERN MASSACHUSETTS—Feb. 15, 7 p.m., Gardner, Mass. "New Developments in Welding of Tool and Dies" by H. J. Greif, sales manager of Eastern Division of Eutectic Welding Alloys Corp.

ASTE Western Industrial Exposition and 23rd Annual Meeting will be held March 14 through 18 at Los Angeles, Calif. Headquarters hotel will be the Ambassador. The Exposition will be held at the Shrine Auditorium.

PHILADELPHIA — Feb. 17. "Carbide Night."

PITTSBURGH—Feb. 4. "Atomic Energy —Its Relation to Tool Engineers."

PORTLAND, ORE.—Feb. 17. Tour of Tetronix for members only.

SAGINAW VALLEY—Feb. 17. Chevrolet Mfg. Plant, VanSlyke Road, Flint, Mich. Tour of the new Chevrolet V-8 motor plant and car frame plant.

SAN FERNANDO VALLEY—Feb. 2, 7 p.m., Hody's Restaurant, North Hollywood. "A New Welding Process for Dies and Thermite Welding" by Art Yeoman of Toolnu, Inc.

SANTA CLARA VALLEY—Feb. 15. "Uses of Industrial Diamonds" by Harry L. Strauss, Jr., technical director, National Diamond Laboratory.

SCHENECTADY—Feb. 14, 8 p.m., American Legion Post, Schenectady. "Low Temperature Melting Alloys as Production Aids" by O. J. Seeds, manager, Alloys Sales Division, Cerro De Pasco Corp.

SEATTLE—Feb. 22. "Engineering Aspects of Tooling" by members of University of Washington faculty.

SPRINGFIELD, ILL.—Feb. 1. "Patents and the Tool Engineer" by Carlton Hill, senior partner of the firm Hill, Sherman, Meroni, Gross and Simpson.

SPRINGFIELD, MASS.—Feb. 14, 7:30 p.m., Springfield Turnverein. "The Next Ten Years for the Tool Engineer," by John L. Schwab, divisional manager, Methods Engineering Council of Bridgeport, Conn.

TRI-CITIES—Feb. 9, 6:30 p.m., Rock Island Arsenal. "Hot Forging" by a representative of The National Machine Co.

TWIN CITIES—Feb. 2, Covered Wagon. Election of officers. "Crush Grinding" by J. T. Welch of Sheffield Corp.

WINDSOR—Feb. 14, 6:45 p.m., Prince Edward Hotel, Windsor, Ontario. "Precision Grinding and Recent Developments" by T. C. Hilbert, Canadian representative for Cincinnati Milling Machine Co.

WESTERN MICHIGAN—Feb. 14, 7 p.m., Varsity Grill. "Plastics and Their Relation to Tooling" by George M. Rice, sales manager, Renaud Plastics, Inc.

LONG ISLAND SPEAKER—George C. Brown, sales engineer for the Ultrasonic Machining Division of Sheffield Corp., was featured speaker at Long Island's November meeting.

PROGRESS in production

ENGINEERS COMPARE METALS FOR SCREW MACHINE WORK

Studies to determine what changes would be necessary for conversion from brass stock to aluminum for producing various parts by screw machine indicate that tool angle is among the most important considerations. Investigations on the subject, made by Don Wells Products for Kaiser Aluminum and Chemical Corp., were two-fold in purpose. First, they were calculated to determine exact cost savings that might be gained were such a conversion made, and secondly, to test screw machine procedures using aluminum on jobs formerly done in brass. Both metals used in the experiment were ½-in. stock. Screw machine-produced parts used were a threaded blowgun nozzle ¾ in. long, and a knurled cap screw ⅜ in. long.

The only mechanical change-over found to be necessary for the job was that cutting tools for brass were ground with a zero degree back rake, while tools used on aluminum stock were ground with an approximate back rake of 10 degrees.

Otherwise there appeared to be little appreciable difference to be found from substituting one metal for the other. Aluminum alloy was found to break into small chips during working similar to those which characterized brass. There was no problem of working the screw machines up to maximum efficient speed in either case.

The knurled parts were produced on a Brown & Sharpe screw machine. In turning both metal parts the same spindle speed of 2660 rpm forward, and the same surface fpm (345) was used. The same was true during threading—spindle speed and surface fpm was identical.

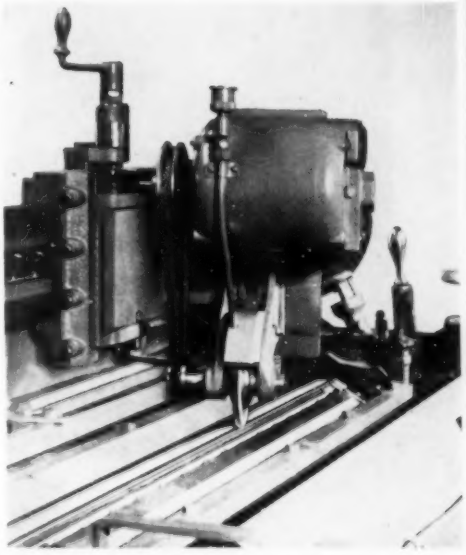
Comparing results, production time was the same both for aluminum and brass. Economies stemmed from more parts per pound obtained from aluminum stock.

ADAPTED WOOD PLANER SIZES NONMETALLICS

Ingenuity inherent in the profession has often solved difficult problems through adaptation of standard equipment to new uses. A development of more than usual interest is the Micro Surfacer introduced by Buss Machine Works.

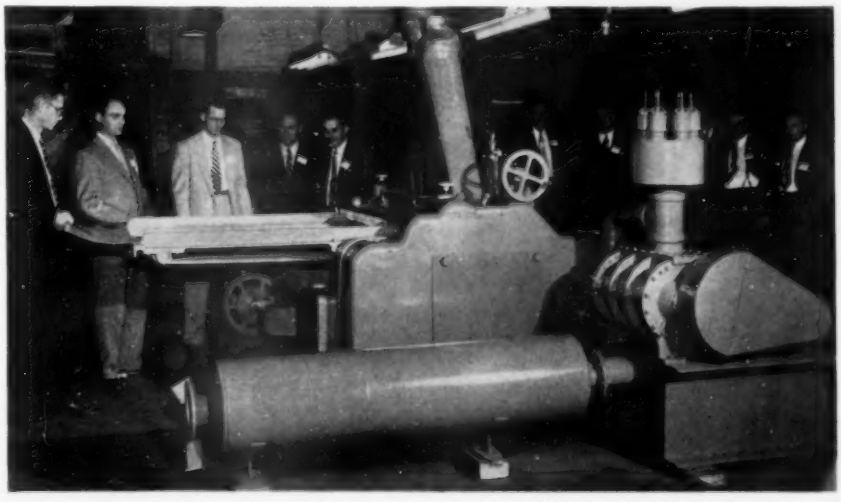
The basic tool has a long established reputation in the woodworking field as a planer. Now with noteworthy innovations, it has been redesigned to size sheets of materials such as rubber and vinylite and other nonmetallics to thickness tolerances within 0.001 inch. Primarily the changes involve use of special solid cemented carbide knives. Six knives, 40 inches long and made by a new Carboloy process are used in the cutterhead. Rotating at 4500 rpm, the head sizes abrasive materials to precision tolerances.

In operation, stock is fed under the cutterhead by rubber sectional feed rolls. A vacuum worktable and a



Close-up view of built-in grinding unit, diamond wheel, and the cutterhead with carbide knives, locking and indexing device for grinding knives in the machine.

Overall view of the Micro Surfacer as it was introduced at openhouse showing.



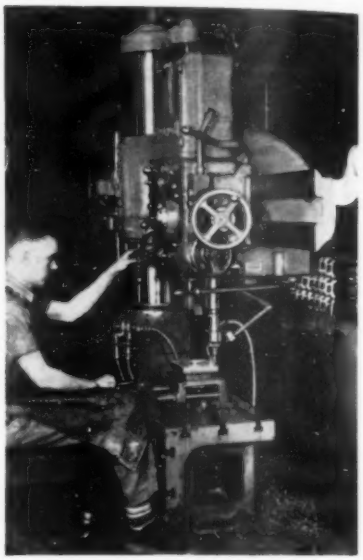
vacuum pressure system at the planing position holds stock firmly to the table, preventing chatter of flexible materials. The vacuum system pressure is controlled by relief valves and the vacuum blower system.

Accuracy of the machine is maintained by grinding the knives in position and by having the table in perfect parallelism with the cutterhead so that the material is sized in the planing operation to the dimension required. A traversing grinding motor unit, using a diamond wheel, is built into the machine so that the knives can be ground within 0.0003 inch of the actual cutting circle of the head.

Besides these special characteristics, the machine offers several other features. Because the knives take chip-like cuts, there is no dust or grit on stock so that removed material is clean and salvageable. The unit is equipped with a variable drive that provides feeds up to 300 ipm. Models are available in widths from 26 to 50 inches, which can accommodate work up to 8 inches in thickness.

LUBRICANT CHANGE SPEEDS UP WORK

Engineers are constantly proving that it pays to keep an eye on different methods of doing routine jobs. By switching its method of lubrication recently, for example, O. K. Rubber Co. realized considerable savings through double tap life, increased tap speed, and improved production, on a typical job of hole tapping. The operation involves tapping holes in a 1⅛-in. thick plate of nickel-chromium-molybdenum alloy steel. Normal procedure has been to cool and lubricate the tap by flood method using a water-soluble oil. Average tap life was 150 holes—breakage and wear destroyed four ⅜-in. taps



Lubricant is directed at the tap and in the hole as spray from single nozzle mounted in front of the work.

during the process of tapping 600 holes in the alloy steel plate at a speed of 265 rpm.

By utilizing a method of lubrication through spray, the company found it could take advantage of a larger tap (½ inch) to drill the same alloy steel plate at almost 38 percent higher speeds with high quality results. After 300 holes the tap which had been used showed only slight wear, further proving the advantage of the system.

The lubrication system, Spray Lube, developed by Norgren Co., is now used on the machine with the control and supply equipment connected to the mixing valve by copper tubing. The mixing valve is mounted on the machine within easy reach of the operator to facilitate adjustment of the spray discharge. A hose conveys the spray from the mixing valve to a nozzle which directs the spray at the work. Pressure on the air line is set at 60 psi, while pressure on the liquid line is set at 62 psi.

PLATING TO PREVENT WEAR

Solution to a puzzle of how to make a lightweight drive arm that possesses high wear resistance has been discovered by a manufacturer of aircraft and heater mechanisms, Herman Nelson Div. of the American Filter Company.

Several possibilities that were tried somewhat successfully proved impractical either because of high cost or weight. However, by using a forged aluminum part which had been plated with tungsten carbide by the Linde Air Co.'s Flame Plating process, engineers got light weight, low inertia and high resistance to wear. Service life was increased from an average of 100-300 hours to more than 1000 hours.

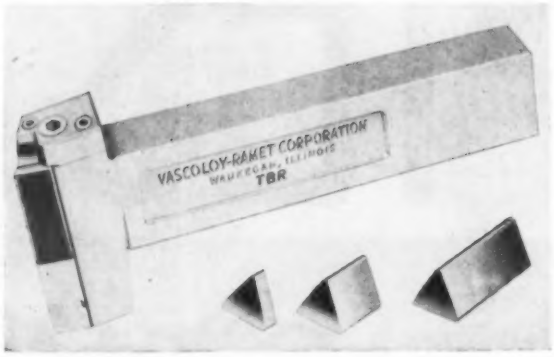
The process utilized deposits a thin tungsten carbide coating on a part. Temperature of the piece being treated never exceeds 400 F during the operation, and there is no possibility of changes taking place in the physical properties of the base metal, while chances of distortion are minimized.

The coating achieved may be left in the as-coated condition, which gives the part a 125 microinches rms; or it may be ground and lapped to 1-5 microinches rms.

GIANT PRESS TAKES SHAPE

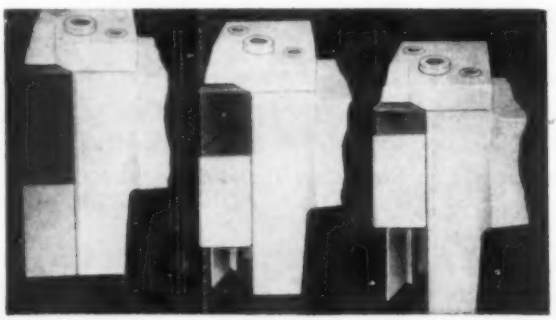
First of the giant forging presses built under the U. S. Air Force Heavy Press Program nears completion at Aluminum Co. of America's Cleveland Works. Here one of the two heaviest components (weighing 460,000 lb. each) is being readied for lifting into place to form half of the moving crosshead of the 50,000-ton press. The unit being built by Mesta Machine Co., is scheduled for production early this year.

CUTTING TOOL COSTS WITH THE CORRECT CARBIDE INSERT!



Style TBR Toolholder for triangular inserts with "Throw-Away" Length, "Half-Length" ¾" and Standard 1½" inserts. Toolholders are available for triangular, square and round inserts in more than 30 different styles and sizes.

Vascoloy-Ramet Corporation in addition to developing the New V-R Toolholder System has developed, in conjunction with this system, two new sizes of inserts, "Half-Length" 1½" inserts and "Throw-Away" Length inserts. In the V-R Toolholder, as the insert wears and becomes shorter, the bottom movable portion or elevator of the toolholder can be adjusted upward by turning the main screw in the top of the chipbreaker plate. Since no part of the insert is needed for holding or clamping, the toolholder permits using all of the carbide insert. Instead of using only about 50% of each insert you actually use more than 90% leaving only the minimum carbide necessary to support the cutting load properly.



As the carbide insert shortens from repeated sharpening the elevator is moved up by turning the main screw on top of the chipbreaker plate. This method of holding the insert permits using either Standard Length, "Half-Length" or "Throw-Away" Length inserts in the same toolholder.

The design of this new toolholder permits the practical use of inserts only half as long as standard 1½" inserts. These inserts are called "Half-Length" inserts. When you purchase two "Half-Length" ⅜" I.C. triangular inserts, instead of one full length insert, you get a total of twelve cutting edges. These six extra edges currently cost only an additional 70¢ over the price of one full length insert . . . or less than 12¢ for each additional cutting edge. When you are using the new "Half-Length" Inserts, the occasional massive carbide failure resulting from unexpected hard spots found in forgings or castings, costs only half as much, since you are breaking an insert only half as big.

If you are in the habit of giving a machine operator enough cutting edges to go through a complete shift without making a trip to the tool crib and if you are using full length ⅜" I.C. triangular inserts, your initial tool inventory, at current price levels, is $12.36 or $4.12 each. But if you were to use "Half-Length" inserts, your initial tool inventory would be only $7.21 or $2.41. In addition to these new "Half-Length" inserts V-R also manufactures all styles and sizes of toolholders with a head length designed for "Half-Length" inserts.

V-R Standard Length, V-R "Half-Length" and V-R "Throw-Away" Precision and Utility Blanks.

Even greater savings are possible with New V-R "Throw-Away" blanks. These blanks are available in two classes: Precision Class and Utility Class. Blanks of the Precision class are ground all over and are intended for use under those conditions where it is necessary to maintain accurate size after indexing. Utility class blanks, more economical in cost, are used where precision indexing is not required.

The relative savings with these "Throw-Away" inserts is tremendous. In quantity the full length inserts cost $4.12, the "Half-Length" $2.41. However, a "Throw-Away" Precision blank is 98¢ and the Utility is only 56¢. The insert best suited for a particular job depends on the work being done and the actual cost of tool reconditioning. If inserts can be reconditioned at a very low cost "Half-Length" inserts might be best. When all of the reconditioning costs are added together, it may cost less, because of the elimination of grinding, to use "Throw-Away" blanks. V-R also manufactures toolholders designed specifically for "Throw-Away" blanks, in all styles and sizes.

New V-R Toolholder for use with "Throw-Away" Precision or Utility "Throw-Away" Blanks.

For additional information on the New V-R Toolholder system and New V-R inserts ask for Toolholder Catalog VR-435A. Write the *Vascoloy-Ramet Corporation, 822 Market Street, Waukegan, Illinois.*

VASCOLOY-RAMET CORPORATION
822 Market Street
Waukegan, Ill.

TOOLS of today

Centerless Grinder

A new No. 2 centerless grinding machine has been announced by Cincinnati Grinders Inc., Cincinnati 9, Ohio. More than 1000 pounds heavier than its predecessor, the new unit incorporates several advantageous features. Self-adjusting Filmatic bearings have been retained for the grinding wheel spindle.

Construction has been engineered to simplify setups and sizing adjustments. Way bearing surfaces are protected against grit and cutting fluid. Slight errors in truing and/or setup are easily compensated for.

In operation, the upper and lower slides—the lower slide mounted on bed ways supports the upper slide which carries the feed wheel—are locked together and glide as a unit over antifriction ways on the bed. Sizing adjustments are accurate, and there is no scoring of the ways. The regulating wheel speeds are infinitely variable, within two ranges, from 11 to 320 rpm.

Twenty-four page catalog No. G-644 contains complete specifications and descriptions of the unit. **T-2-1491**

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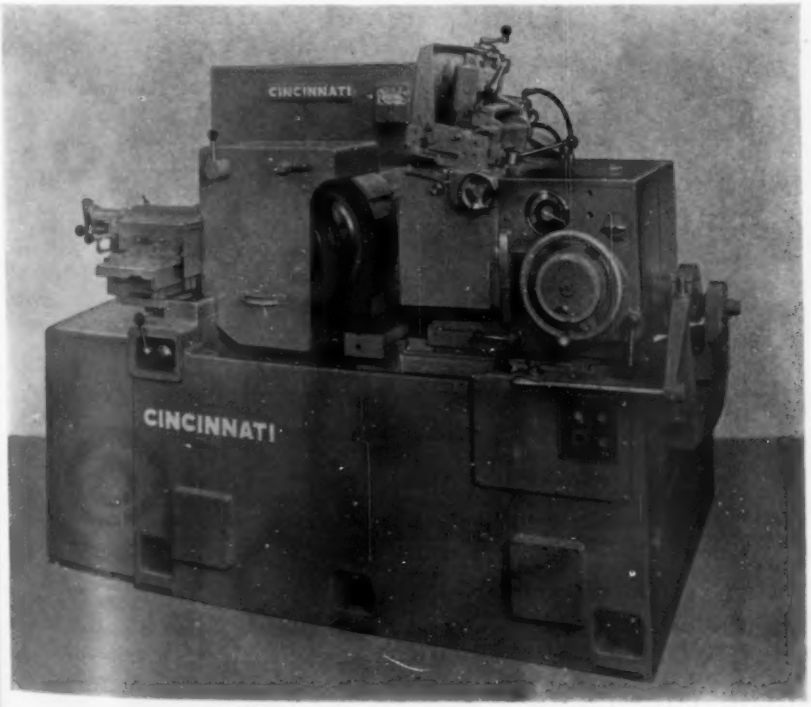


All-Purpose Welder

A universal, combination arc welder called the Idealarc, that allows either a-c or d-c welding current, has been developed by The Lincoln Electric Co., Cleveland 17, Ohio. Most outstanding feature of the unit is that it is capable

of providing an ideal arc for any manual welding application and is so designed to give welders the means of selecting the proper arc for a specific job. Further, the operator may select either a-c or d-c to give either a soft or forceful arc.

The unit may be obtained as an a-c welder without the d-c current, and the d-c package can be attached easily whenever desired. Or it may be had as a combination a-c and d-c machine with a switch for selecting either current.

For a-c welding jobs, the unit pro-

vides a single phase transformer type welder; for d-c welding, the Idealarc provides d-c welding current through heavy-duty rectifiers.

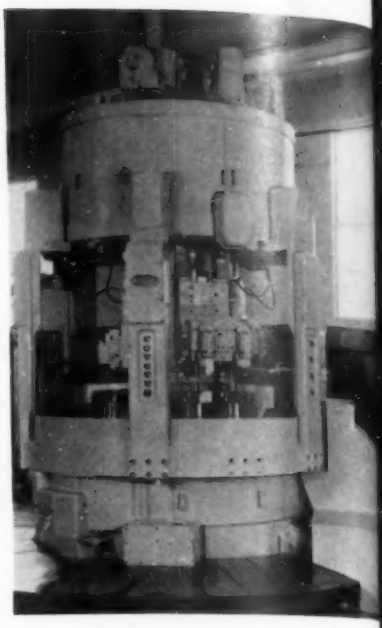
To give further special-machine advantages for either type welding, the unit is equipped with an arc booster switch for selecting normal or "hot" starting. Both voltage and amperage are controlled to give desired control of arc characteristics.

Current models available are 300, 400 and 500 amp a-c, combined with d-c capacities in 200, 300, 375 and 450 amps. **T-2-1501**

Vertical Chucking Machine

The Bullard Co., Bridgeport, Conn., has introduced its most recently designed multispindle vertical chucking machine, the Type L Mult-Au-Matic. It incorporates many developments widely used in production of parts in automotive, aircraft, agricultural machinery, diesel engines, electrical and oil field tools, etc.

Two outstanding features of the unit are the control system that facilitates head setting and tool adjustment with a minimum of the operator's effort, and



Above: Panels have been removed from the Mult-Au-Matic here to better display the operation of the machine.

a new screw-type feed mechanism. This mechanism has a total available stroke of 16 inches. Thus, it provides a more constant advance of the cutting tools to the work. Further, since only the required portion of the total stroke need be used, time is saved in the automatic cycle.

The spindle carrier index is speeded up because of an improved type of mechanism, further reducing time lost between cuts. A gear synchronizer permits feed and speed selection at each work station. Two spindles per station are yet another feature. In certain applications this permits first and second chucking of work at each working station on the same machine. In instances where first and second chucking applications cannot be handled in this manner, double indexing may be used.

Heavier construction of the machine permit input of up to 150 hp. For simplified maintenance, the design has made all control units and gear units readily accessible. Optional items for the unit include automatic loading devices and automatic gaging equipment. **T-2-1502**

Gap Press

Among the group of fabricated steel gap presses introduced by the Minster Machine Co., Minster, Ohio, is the G1-110-ton geared press especially adapted to automation. It has built-in panel-leg control cabinets containing all electrical, air and lubrication controls for press or automation equipment.

Single entrance connections for air

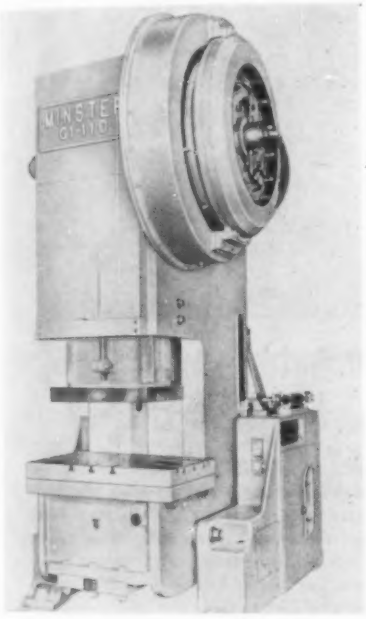
and power permit quick connection for immediate operation or disconnection for fast relocation.

Another feature available on this press is the patented Adjustable-in-Motion Minster Rotary Limit Switch which is direct driven through mitered gears—an efficient unit for synchronizing automation equipment. It is rotor type with three or more circuits as desired.

These presses have either a fixed or inclinable base. The inclining base type is arranged for inclining to three fixed positions from vertical to 30 deg and can be equipped with manual, air-powered or motorized inclining attachments.

Massive steel frame sections increase their compressive strength for minimum deflections in steel C frame construction and build up vibration dampening qualities.

Slides have box-type cast construction designed to avoid way deflection, and ways are exceptionally long.



Die cushions are telescoping and internally guided for travel in perfect alignment with slide without guiding ways. Sliding-type die cushions are available on fix base G1 presses.

These 110-ton presses have standard slide stroke of 5 inches with 80 or 105 strokes per minute on flywheel press or 37 strokes per minute on geared press; bed area is 27 x 42; slide area, 21 x 28. Special increased geared press speeds are available. **T-2-1511**

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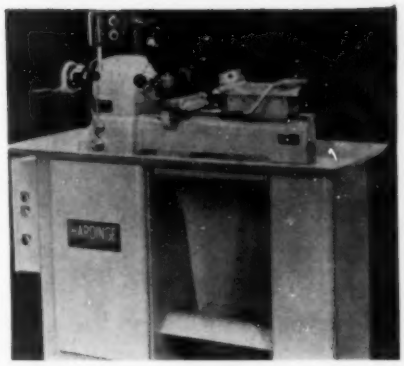
Second Operation Unit

Instant change of spindle speeds between 230 and 3500 rpm at the touch of a button is the outstanding feature of the Model DSM59 second operation machine made by Hardinge Brothers, Inc., Elmira, N. Y. The machine does not have to be stopped to make spindle speed changes. A control box located conveniently over the headstock allows the operator to increase or decrease the speed of the spindle to obtain the most efficient chip removal and surface finish.

By permitting chucking of partially finished parts as well as close-tolerance turning, forming, boring, drilling, threading, and facing rapidly, with low-cost tooling, the unit reduces usual tooling costs, upkeep and downtime on automatics. It is easy to set up and relatively inexperienced operators can turn out parts on it within close tol-



erances and fine finish on a production basis.

In addition to the pushbutton variable spindle speed control, the tool is a fast, economical machine to operate. Collet or step chuck can be opened or closed while the machine is in operation, permitting selection of a full range of collet tension from light to heavy-holding power without the use of extra tools. Fitted with the 5C round Hardinge collet, the DSM59 has an extra large 1 1/16-inch capacity.

Full details concerning the machine are contained in the Hardinge DSM59 bulletin. **T-2-1521**

Hammer Drill

The Syntron Co., 340 Lexington Ave., Homer City, Pa., has added the Model 27-RO to its line of electromagnetic hammer drills.

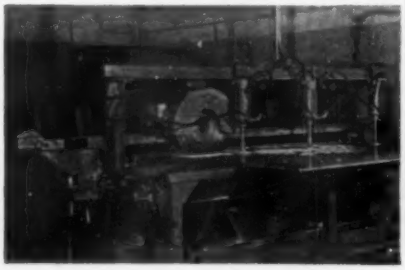
Change in construction has greatly increased the power, while the use of a core drill makes possible hole drilling of 3-inch diameter maximum. Previously the maximum hole drilling capacity was limited to 2-inch diameter holes.

The hammer drill features automatic rotation of the drill bit by means of a simple rubber ratchet mechanism, which utilizes the recoil of each blow of the hammer piston to slightly turn the bit. Thus, the 3600 blows per minute of the hammer piston rotates the bit with suitable torque at the right speed. **T-2-1522**

Saw for Universal Cutting

A low-cost saw, designed particularly to cut unwieldy plates or slabs on a production basis, is being made by Meiermatic Saw Div., Meier Brass & Aluminum Co., 1471 E. 9 Mile Rd., Hazel Park, Mich.

Among its main advantages are reduced cutting time and setup time on nonferrous plates. Automatically adjusting air cylinders provide uniform clamping pressure adjusting up to 5 inches thick. Aluminum plate up to 5 inches thick and up to 9 feet 6 inches long in any width may be sawed, while maxi-



mum thickness of other materials is dependent upon their machinability. Time for cutting a 96-inch. length of 1 in. thick aluminum plate is 43 seconds, using a circular, carbide-tipped blade, and cuts are clean and smooth. The cutting motor is 10 hp geared-in-head induction type. Arbor speed is a 2150 rpm with a 1-in. arbor and maximum blade diameter of 22 inches. A safety device incorporated in the sawing machine, automatically cuts electric power to the saw should the air pressure drop below safe minimums for positive clamping.

T-2-1531

Oiling Device

Oil Mate, an oiling device that looks like an automatic pencil and delivers oil by the drop is being made by E. S. Turin Engineering, 3906 Cohasset, Burbank, Calif. This leakproof pocket clip pen-like oiler is engineered so that only a single drop of oil is released when a plunger at the top of the tool is depressed.

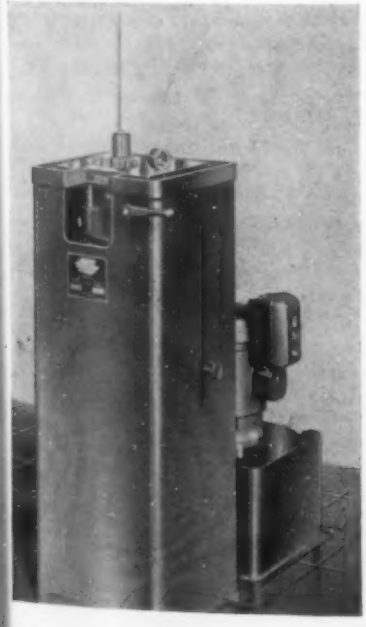
A barrel contains a reservoir of transparent Tenite so that the amount of oil is visible at all times. It is simple to fill with any viscosity oil required.

T-2-1532

Broaching Machine

A low-cost, vertical production broaching machine has been developed by The Pioneer Broach Co., 6434 E. Telegraph Rd., Los Angeles 22, Calif.

The unit, called the VM215, can be set up rapidly to cut keyways or square, oblong, hexagon, irregular, splined or round holes using Pioneer stock broaches and with the same precision



secured with larger machines. In addition, it may be used for surface broaching operations.

A vertical pull type, the machine provides up to 2 tons of hydraulic pulling power and 15 inches of cutting stroke. Complete cutting stroke and return to starting position is cycled in 13 seconds. An adjustable stop is incorporated to automatically limit stroke to actual requirements. The motorized hydraulic unit that powers the broach is self-contained and base mounted at rear of machine. **T-2-1541**

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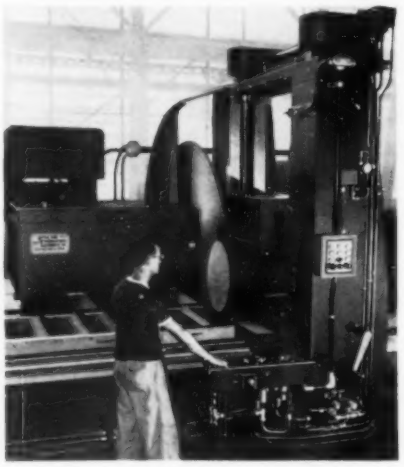
Circular Sawing Unit

The Motch & Merryweather Machinery Co., 888 E. 70th St., Cleveland 3, Ohio, has introduced the Model No. 5 high-speed circular sawing machine with capacity for cutting 43-inch diameter aluminum billets. Primarily, the unit

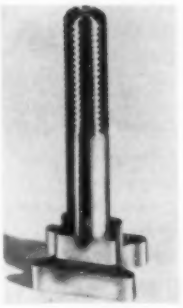


was developed to meet the need of the heavy press program, which requires accurate, fast production of cutoff aluminum stock to produce large aircraft compounds.

The machine features a steel gear case housing a heavy-duty, helical gear train mounted on preloaded roller bearings. The saw head ways have nonmetallic wear strips and forced feed lubrication. Variable saw feed is by hydraulic cylinder.

Ample clamping of large stock is provided by the heavy upper clamp and gooseneck. Powered roller conveyors extend on both sides of the vise. Each section can be elevated independently to facilitate movement of the stock and can be reversed if desired. **T-2-1542**

Bolts with Concave Heads



An unusually designed T-slot bolt has been introduced by Standard Parts Co., 1000 Broadway, Bedford, Ohio.

The concave head automatically cleans out the slot as the bolt travels on the worktable and pushes dirt and chips to the center of the slot instead of to the sides.

The patented construction adds more than 50 percent to the bearing surface. This increased under slot traveling surface assures greater rigidity, with less chance of job slippage or breaking out slots.

The bolts are heat treated to give three to four times greater strength and coined after forging to assure precision surfaces. Their tensile strength is 200,000 psi.

They are available in ½-in. diameter, from 2 to 18 inches long under the head; ⅝-inch diameter, from 2½ to 18 inches long under the head; ¾-inch diameter, from 2½ to 24 inches long under the head. Also available in ⅞, 1, 1⅛ and 1¼-inch diameters. **T-2-1543**

Hardness Tester

Soft materials, even electro-deposited copper in the Rockwell E-20 to E-100 range, can be tested with the Webster hardness tester, Model BB-75. Originally this tester was developed to meet the need of the phonograph record industry for a quick, easy and accurate method of testing the hardness of electro-deposited copper, and copper in the low hardness range. However, its construction permits testing of other common materials comparable in softness to fully annealed copper.

The BB-75 features one-hand opera-

tion. A round anvil permits testing of round, square, irregular and tubular shapes within its ¼-inch capacity. It offers extremely simple operation and requires no special skill or training.

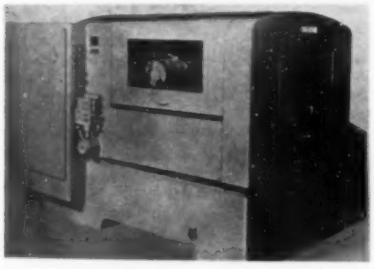
Readings are always accurate and do not depend upon the operator's skill. Test is made simply by placing the material being tested between the anvil and housing, and applying pressure to the handles until the housing contacts the material. Degree of hardness is then read from the dial indicator. This reading can be correlated by means of a graph to a Rockwell E hardness scale.

Details are available from the manufacturer, Webster Instruments, Inc., 11856 Mississippi Ave., Los Angeles 25, Calif. **T-2-1551**

Wet Grinder

An automatic wet-type grinder for high-speed production of straight bevel Coniflex gears has been announced by the Gleason Works, 1000 University Ave., Rochester 3, N. Y.

This machine, the No. 105 straight bevel coniflex grinder, produces gears up to 8½-inch pitch diameter, 1⅜-inch face width, and 3 DP. All standard pressure angles can be ground. Fine pitch gears are ground directly from



the solid blank. Gears coarser than approximately 20 DP are ground after cutting and hardening. Since the gear teeth are finished after hardening, there is no problem of heat treating distortion, and it is possible to produce hardened straight bevel gears with higher limits of accuracy.

After the gear is chucked in the workhead, the entire grinding cycle of the No. 105 is automatic, including the correct number of passes, in-feed of the work, and dressing of the wheels at preselected intervals. A wheel speed control unit increases the speed of the wheels as the diameter decreases from dressing, thus maintaining a constant grinding surface speed.

Hydraulic guard door and chucking of the work are controlled by a single lever, reducing the change time per piece. **T-2-1552**

Polishing Oils

Two polishing oils for use in grinding and finishing ferrous and non-ferrous metals have been developed by D. A. Stuart Oil Co. and Minnesota Mining and Mfg. Co.

The oils, Excelene FD for ferrous metals and Excelene NF for nonferrous metals, are applied by spray to abrasive belts to reduce loading, give them longer life, and aid in faster grinding.

Literature can be obtained from D. A. Stuart Oil Co., Ltd., Dept. 99, 2727 S. Troy St., Chicago 23, Ill., or from the 3M Co., Dept. A-1613, St. Paul 6, Minn. **T-2-1553**

Finish for Metals

Porcenells, a line of silicate or glass-like protective coatings, which can be fused to any ferrous metal at moderate temperatures have been announced by Vitreco, Inc., a research company jointly owned by Poor & Co., Chicago, Ill., and Youngstown Sheet & Tube Co., Youngstown, Ohio.

Spray, brush or dipping, may be used to apply the silicates, which are then fired at temperatures from 900 to 1200 F, depending upon the type of finish desired. Permanent and decorative protection is provided at costs comparable to galvanizing or synthetic resin

paints. In substance, Porcenell is similar to porcelain enamel, but is said to be more easily and less expensively applied primarily because of the low firing temperatures required. Surfaces suitable for Porcenell include sheet and plate as well as cast, wrought and malleable iron and high-carbon steels.

Being inorganic in composition, the Porcenells are not subject to corrosion or organic change. They are fireproof, scratch resistant, permanent color, and do not react to moisture or any corrosive agent normally found in the atmosphere.

Available in a variety of permanent colors and in textures ranging from full matte to high gloss, ordinarily a single coat of Porcenell is sufficient. It also serves as a corrosion-proof base coat, over which any paint can be applied.

For further details write to Allied Porcenell, Inc., 851 S. Market St., Waukegan, Ill. **T-2-1561**

Molded Valves

Ostensibly the first all-molded PVC valves and fittings have been designed by The Lunkenheimer Co. of Cincinnati 14, Ohio. This line, patented under the name Luncor, resists most

chemicals used in industry. The molding process gives the PVC material, of which the Luncor valve is made, unusual strength, protects its natural corrosion-resistance, and substantially reduces manufacturing costs. The valve will be marketed at a price lower than stainless steel and other alloy valves.

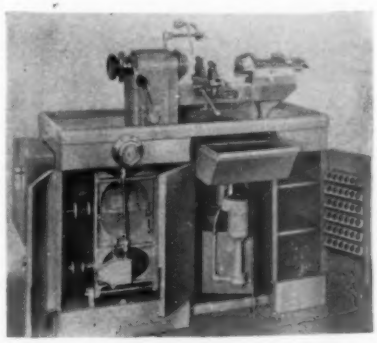
Base material is polyvinyl chloride (PVC), now available in the form of corrosion-resistant piping. It is molded in rigid form, suitable for pressures up to 125 pounds and 150-deg temperature. The valve is presently available in a Y-type globe design.

A complete line of plastic fittings made of the same material is also available from Lunkenheimer. **T-2-1562**

Screw Machine Drive

A new drive incorporated in the design of its hand screw machine, called No. 73, has done away with various problems common to this type machine.

Prime among its advantages are that



continuous reversal of spindle direction is now possible without any resulting motor overheating problem, because the motor always runs in one direction. The gear box drive has a clutch arrangement providing mechanical reversing. Helical gears in constant mesh, together with a clutch yoke and variable pitch drive pulley, comprise the basic

features of this new gear box drive. They eliminate the heavy resistances usually required in the electrical drive, and also provide normal overload protection for the motor. Manual changing of belt positions to accommodate speed variation is unnecessary since a positive drive timing belt replaces the V-belts previously used. The variable pitch pulley on the motor shaft provides stepless speed control in a range from 100 to 3500 rpm, through a worm and worm gear operated by a handwheel. A flip of a lever provides 5:1 high-low spindle speeds.

As still another advantage, the operator can brake the spindle shaft without stopping the motor.

Complete details on the unit may be had from the manufacturer, the Wade Tool Co., Waltham, Mass. **T-2-1571**

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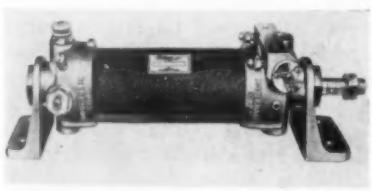
Coaxial Cylinder

Smoothness and precise control of hydraulic power from any shop air supply are provided by the cylinder developed by Modernair Corp. The unit offers several important features.

Of unusual coaxial design, the air cylinder surrounds the oil cylinder, thereby avoiding excessive length. Expanding exhaust air helps cool the oil



to assure dependable operation under continuous rapid cycling and heavy loads.

Automatic models are available with built-in controls (remotely operable if desired) of speed, direction, adjustable fast traverse either direction, and automatic recycling. Standard models can be remotely controlled with conventional valving and piping.

The unit develops hydraulic piston thrust of 3.14 x airline pressure, and pull of 2.7 x airline pressure. It is available in any stroke length to 72 inches, and may be used with any standard modernair cylinder mountings.

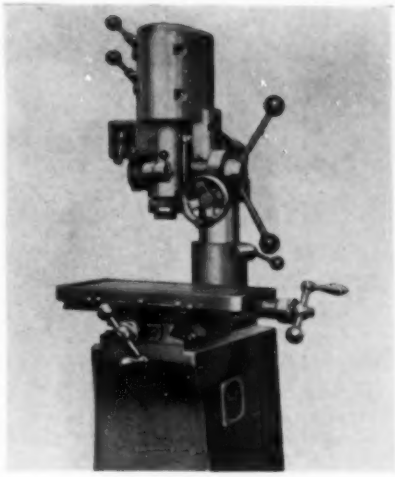
Complete data, prices and application information may be obtained from the maker, 400 Preda St., San Leandro, Calif. **T-2-1572**

Vertical Mill

A. B. Arboga Maskiner of Sweden have created a vertical mill under a design furnished by Masters Precision Tools. The mill, identified as EM 825, has a swivel-type head permitting a full 90 deg turn, and a 12-in. clearance below the spindle.

Main features of this machine are its unusually low cost, and the power from a direct gear drive assembly. Quick change of levers permits eight speeds, ranging from 125 to 1540 rpm. Its two-speed 1 hp motor is built into the frame to avoid bulky construction.

The spindle has a hand wheel feed with a 4½-in. travel which can be easily disengaged in order to use the



quick return. The heavily constructed feed table has a 11½-in. longitudinal travel and a 6-in. cross feed travel. The cutaway front of the base design permits the operator to stand close to the work.

Complete details about the unit contained in a catalog available from Masters, 3613 Archer Ave., Chicago 9, Ill. T-2-1581

Portable Electric Drill

A low-cost portable electric drill offering advantages expected from more expensive models is being marketed by Porter-Cable Machine Co.

Called the Model 137, this quarter-inch drill, with its attachments is a very versatile machine. Using high-speed twist drills, it quickly penetrates wood, steel and other metals, plastics, all types of composition board, and concrete. Us-

ing abrasive disks, the machine may be used to sand wood or metal, remove paint and varnish. It utilizes a wire brush attachment for rust removal. A special bracket and grinding wheel converts the drill into an electric bench grinder.

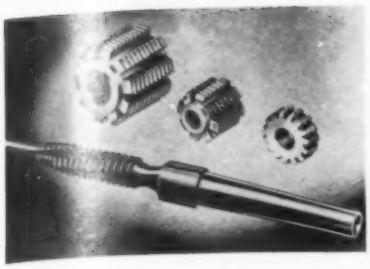
An optional vertical stand converts the tool into a drill press. It can be installed or removed from the stand without tools in a few seconds.

For price and literature on drill, in the United States address the company at 52 Exchange St., Syracuse 8, N. Y.; in Canada, write Strongridge Ltd., Box 1029, London, Ont. T-2-1582

Thread Cutting Tools

Complete line of Fr. Piltz & Sohn of Heidenheim/Brenz, Germany, has been introduced to the United States. Among the items are threading, thread gaging and gear hobbing tools, developed to meet demands of optical and precision instrument industries. The distributor is Eric R. Bachmann Co., Inc., 27-11 41st Ave., Long Island City 1, N. Y.

The fine pitch gear hobs are made in several sizes to fit both American and



foreign-made gear hobbers. The hobs come with bores of different sizes and shapes from a cylindrical bore of 8 mm (0.315 in.) up to the No. 1 and No. 3 Barber-Colman taper. There is in addition a special line of shank type hobs with cylindrical or tapered shanks. Also available are special worm gear hobs for any number of leads and any of the fine pitches, while yet another development is the precision gear hob for cycloidal gears.

A second item in the Piltz line is ground thread chasers for optical and instrument threads. The shanks are fully ground to permit perfect alignment of the thread with the workpiece. Internal thread chasers of flat or circular design also are available.

Other items in the line include thread ring and thread plug gages, and small precision taps of high-speed steel for very fine pitches for all forms of threads.

T-2-1591

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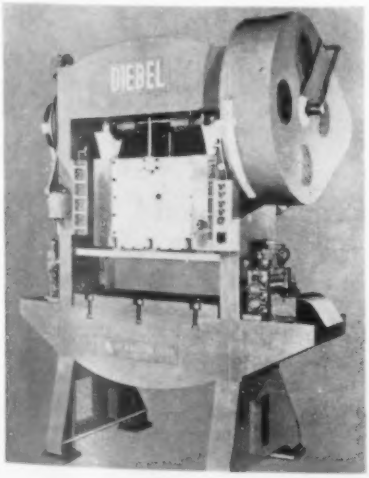
Steel Press

Introduction of a double-crank welded steel press has been announced by Di Machine Corp., 2701 W. Irving Park Rd., Chicago 18, Ill., builders of Diebel automatic presses.

The press is available with 30, 37 and



45 inches between uprights with a 10-inch width of feed. Speed range from 80-240 spm.

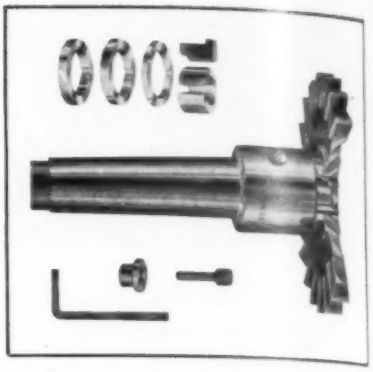
Features include: cylindrical-type ram for accurate alignment, and air-clamped feeds to prevent stock distortion and permit positive feeding. Standard equipment on the press also includes a balanced crankshaft, air counterbalances, automatic metered lubrication system, complete electrical controls, air clutch and specially designed shock mounts.

T-2-1601

Milling Machine Arbor

Sierra Machine Co., 4th and Dwight Way, Berkeley 10, Calif., has introduced a unit called the Peterson milling machine arbor, that permits a side-milling cutter to do the work of a large shell end mill. In operation it allows a standard six-inch milling cutter to cut a full six inches across a flat surface.

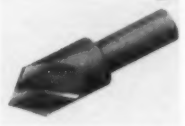
Among its advantages, the tool accomplishes shaper jobs with speed plus precision on both horizontal and vertical work.



Important elements in the tool are a half-split tapered bushing and a flush tightening screw. These, with the use of six hardened and ground spacers, permit 40 cutters to be fit to a single arbor, providing the advantage of exceptionally broad versatility. The half-split tapered bushing avoids the nut that ordinarily protrudes beyond the face of the cutter; the expanding bushing does away with chatter; and the tool steel hardened key makes for positive drive. **T-2-1602**

Single Flute Countersink

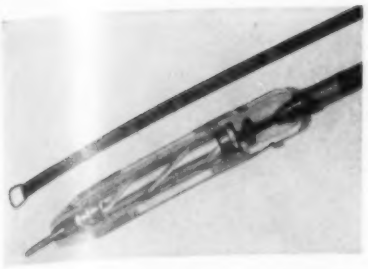
Simplicity of resharpening is the outstanding advantage of a Uniflute countersink developed by M. A. Ford Mfg. Co., 753 W. River St., Davenport, Iowa. The tools, which are engineered for maximum efficiency with a single flute design, can be resharpened many times in the company toolroom prior to factory reconditioning with obvious economy. Regrinding can be either by hand or by machine.



The Uniflute countersink covers a wide range of hole sizes with one diameter tool. Its cutting action is effective from the working point to the major diameter, permitting most deburring or countersinking applications to be accomplished with fewer tools. **T-2-1603**

Pencil Grinder

Nu Jett Products Corp., 1355 Michigan Ave., Grand Rapids, Mich., has announced an improved model 100,000 rpm pencil grinder. The cutaway view shows simplicity of the design. In operation, air travels at high velocity through the rifling and carries the fluted rotor with it. There is no interruption of the air stream, thereby allowing practically



vibrationless operation.

Lack of pulsations means the rotor is constantly suspended in a cushion of air which relieves the ball bearings from the bulk of the load. Spent air is directed upon the point of the cutting tool, keeping work free of chips. **T-2-1611**

Auxiliary Milling Table

Viking Industries, Rockford, Ill. has produced a Micro auxiliary milling table that may be used to advantage to convert quickly a screw feed milling machine to hand feed production work. Easily bolted to the milling table it supplements, it serves to double use of large mills. As a further advantage, the auxiliary table can be removed and replaced on a mill without disturbing a setup.

The 4 x 14-in. table has a 7/16 in. T-slot and provides a 6-in. maximum adjustable table travel. **T-2-1612**

Dial Saw

Erwood, Inc., 1770 Berteau Ave., Chicago 13, Ill., has introduced a No. 400 dial saw which has a larger capacity than the previous model. This saw cuts holes from 1 1/8 to 3 1/2 inches in diam-

eter, in steel, copper, brass, aluminum, plastics, wood and many other materials.

Each tool is complete with pilot drill, and three sets of cutting blades; one for steels for 3/8-inch depth; one for nonferrous metals and plastics; and one set with 1-inch depth for wood and other similar materials. **T-2-1613**

Drilling Unit

The Maximus, a large base toolroom drilling machine, announced by The Hamilton Tool Co., Hamilton, Ohio, is a supersensitive unit designed to drill small holes (0.004 to 5/16 inch) in all drillable materials.

With its extra large, accurately machined base pad, 21 x 17 inches, it affords ample working space for dies, jigs, fixtures, and other toolroom parts. Auxiliary demountable worktables for small work may be supplied at extra cost.

Several advantages are offered by the machine. It drills to the center of a

16-inch workpiece. Four spindle speeds are obtained through one drive. A choice may be made from four available drives which provide spindle speeds from 750 to 8750 rpm. The drilling unit is self-contained and swings radially on the column and locks in any position. All moving parts are completely guarded. **T-2-1621**

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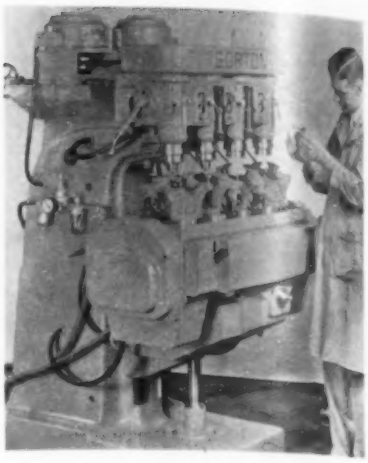
Semiautomatic Duplicator

A high-production 4-spindle duplicator has just been introduced by the George Gorton Machine Co., 1321-60 Racine St., Racine, Wis.

Design of the tool is such that heads and rotating fixtures operate in pairs, each pair of fixtures being governed by a separate master. Two masters, one for each pair of fixtures, are located within the table assembly. This design permits one pair of identical parts to be processed by one pair of cutters and fixtures, while the other pair performs a different



operation on two other pieces. Two heads are in operating position while the other two are idle during unloading, engaging and reloading.

All movements of the duplicator are protected by electrical interlocks.

These units will do continuous or interrupted profiling of internal or external surfaces, groove and rout piece parts at a high-production rate with excellent repetitive accuracy. This type of machine also can be designed with more spindles and more range, with or without variable down feed, depending upon individual requirements.

T-2-1622

Universal Vise

Adaptability is the prime advantage of the Uni-Machinist vise developed by Emmert Mfg. Co., Waynesboro, Pa. The unit offers an extensive combination of holding jaws—one pair for fitting and filing; one for round or finish work; one for rings; segments, hollow parts or irregular shapes; one for tapers, round or square, and for smaller metal rods; one for cylinders. Jaws may be used independently or in combination, giving a very broad variety of holding surfaces. Construction of the vise is so that any two pair of jaws may be brought into use at the same time for gripping work, permitting a maximum gripping dimension of 8 in. **T-2-1623**

Horizontal-Radial Drill

A unit, originally designed by the Govro-Nelson Co., 1931 Antoinette, Detroit 8, Mich., for the drilling of radial holes, has been altered to provide vertical drilling in addition to radial drilling. A vertical bracket which holds an automatic drilling unit with a multiple head, enables it to drill 5 radial holes and 2 vertical holes simultaneously.

Although a standard machine, the variety of ways in which the drilling units may be arranged enables it to take

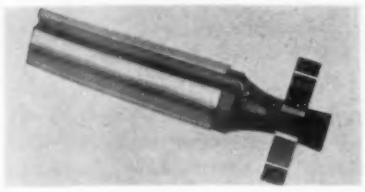
the place of special machines for many different drilling operations. For example, the drilling units may be stationed around the circular table in any position required by the part being drilled, and they may also be moved endwise on riser plates.

When equipped with Govro-Nelson tapping units, it may be turned into a versatile tapping machine. It has a range of 1/32 to 3/8 inch on drilling operations and 0-80 and 3/8-16 on tapping operations. **T-2-1631**

Keyseat Cutter

Quality Tool Works, Waukegan, Ill., has added a new-style keyseat cutter to their regular line. The line features a tapered shank, premium grade HSS and a special surface treatment after the cutter is finish ground.

In use the cutter shank is securely locked into a special holder which will



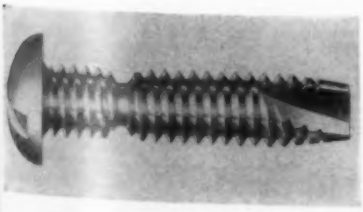
fit any standard milling machine. This driving arrangement provides an unusually rigid and true-running setup.

The cutters are available in forty-one standard sizes from stock, or special sizes made to order. Any shank-type milling cutter can be made with this tapered shank to fit these special holders. **T-2-1632**

Break-Off Screw

Break-Off thread-cutting screws for forming studs in cored holes of die castings have been developed by Shakeproof, Div. of Illinois Tool Works, 2501 Keeler Ave., Chicago 39, Ill., to simplify attachment of the die-cast piece to another object.

The screw, which can be hopper fed from power screwdrivers, is driven into the untapped cored hole until it bottoms. Torque is then increased and the upper portion of the screw, including

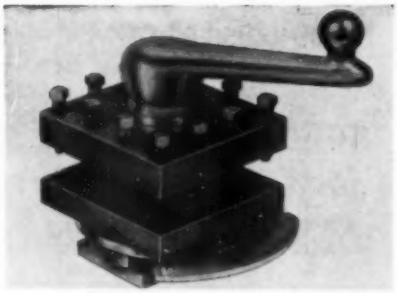


the head, twists off at a necked-down section of the screw, leaving a protruding stud on which a nut can be threaded. The head portion may be designed for re-use in a different type of application.

Complete information and samples (in #8 size) are available from the division. **T-2-1641**

Lathe Turret

An unusual lathe turret called the Elby French turret toolholder, has been introduced by the Manufacturing Div. of O. K. Rubber, Inc., Littleton, Colo. Accurate indexing, with 120 possible positions is the main feature of the device.



Its other advantages include a 12-position detent selection, plus or minus 0.001 at 24 in. from C/L, ideal adaption for carbide tools (holds 4 tools), and availability fitted to individual lathes. **T-2-1642**

Stair-Climbing Truck

A hand truck designed to safely double the load a man can roll up steps and treble the load he can move down stairs or ramps has been announced by Valley Craft Products, Inc., 750 Jefferson Ave., Lake City, Minn.

A special ratchet mechanism enables this stair cart to roll upstairs step by

step as the operator pulls a cable drive.

Two-wheel safety brakes are incorporated in the truck to allow control when descending ramps or stairs. Features such as interchangeable shoes, sealed ball bearings and steel tube construction assure load flexibility and a long service.

Six different models are available for handling various sizes of loads, including a special barrel cart and a complete welding cart. **T-2-1643**

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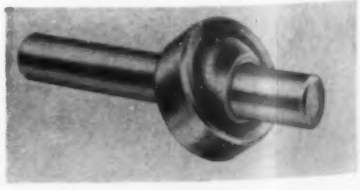
Self-aligning Bearing

A ball-action self aligning bearing or bushing with the inner and outer parts separated by a molded natural rubber, Buna S, Buna N, neoprene or Silicones cushion, is made by A. J. Berna Co., 20160 Sherwood, Detroit 34, Mich.

The molded rubber or neoprene forms a cushion between the two metal parts of



the bearing. This cushion, combined with the ball-action self-aligning feature, reduces and absorbs vibration, shock and sound. The bearing can also be supplied with needle bearings or a bronze bushing insert for rotary motions.

T-2-1651

Adjustable Adapter Shank

Burg Tool Mfg. Co., P.O. Box 48, Gardena Sta., Gardena, Calif., has made available a line of adjustable adapter shank Toolflex toolholders that can be furnished with Morse taper sleeve, straight bore or tap collets. They are

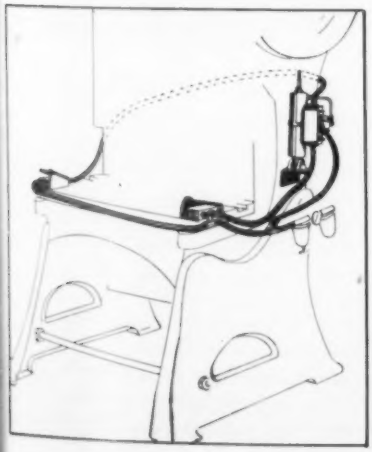
especially suitable for close center applications and can operate as close as ⅞-inch centers. Simplicity of construction features only four main parts, assuring long, service-free life. A Neoprene insert provides universal float that corrects for both parallel and angular misalignment.

T-2-1652

Power Machine Control

Power presses, brakes, shears and other machines utilizing mechanical clutches, may be controlled by packaged PMC pneumatic control now in production by the Modernair Corp., 400 Preda St., San Leandro, Calif.

Principal advantages of the unit include reduction of operator fatigue and improved operator protection on



hazardous machinery. The unusual pneumatic circuit requires that both operating valves be depressed before action takes place, assuring that operator's hands are out of danger. Only one non-repeat action occurs when both valves are depressed.

The PMC unit, which operates from the shop air line, is available in either 2 or 3-inch cylinder bores, and any desired stroke length. Literature, helpful application data and prices may be obtained by writing to the maker.

T-2-1661

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Stud Welder

A versatile stud welding gun, the NS-9, has been introduced by Nelson Stud Welding Div. of Gregory Industries, Inc., Lorain, Ohio.

The gun is being made available with two different sizes of cable, one for welding studs with diameters up to one-half inch and the other for any diameters from 10-gage up to one inch and greater.

Improvements incorporated in the new design permit accommodation of a

greater range of stud length without changing adaptors or other accessories. In addition, arc length can be adjusted without disassembly, while new coil design offers greater lifting power and improved efficiency. Smooth barrel design and elimination of side cable loop now simplify accurate stud alignment on the workpiece and give the tool a high degree of precision balance.

Reduction in the number of electrical connections from three to one has made for increased operating efficiency and simplified maintenance. **T-2-1662**

Band Saw Brazer

Oliver Machinery Co., Grand Rapids 2, Mich., has designed and manufactured an electric band saw brazer, for brazing bi-metal saw blades from ⅛ up to 1½ inches wide.

This accurate unit, which utilizes electric heat of resistance for melting down

the soldering metal, may be used by any workman and requires no special skill for operation. It offers large capacity, is simple to operate, and provides quality results.

Among important features of the brazer are the two spring devices which hold the back edge of the blade against the back rail, thus insuring a perfectly straight braze. Another feature of the unit is that it prevents too great hardness of the steel during the process by means of an automatic tempering arrangement in the machine. **T-2-1671**

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Impact Wrench

A squatty impact wrench, being shown by Mall Tool Co. at the Plant Maintenance Show in Chicago is designed to handle hard-to-get-at production and maintenance jobs. The wrench is only 8½ inches high with a spindle offset of 2⅛ inches. It features a flat back to enable an operator to place his chest or shoulder behind the wrench.

The tool can remove large nuts and bolts, though frozen or stripped, even in unusually tight spots, in seconds.

The 19¾-lb wrench delivers 1800 impacts per minute. Catalogued as ⅞-inch nut and bolt capacity, it is furnished with ¾-inch square pin lock drive.

More information concerning the wrench is available from the company, 7725 S. Chicago Ave., Chicago 19, Ill. **T-2-1672**

Punch for Steel Makers

Service Machine Co., Inc., 216 Miller St., Elizabeth, N. J., has announced the availability of its unusual Semco S-34 structural punch for the first time in the United States. The S-34, which was specially designed for steel fabrication, is neither cumbersome nor space consuming. Over-all dimensions are 81 inches high and 72 inches deep, with floor-space requirement of only 34 x 72 inches; however, although compact, the punch is still rated at 60 tons. Holes up to ⅞ inch in diameter through ¾-inch mild steel and holes up to 1 1/16 inches in diameter through ⅝-inch mild steel can be punched.

The throat is 20 inches deep and 14 inches high, suitable for punching webs and flanges of standard I-beams from 4 to 24 inches, H-columns from 4 to 12 inches, wide flange beams with flanges up to 12 inches, as well as angles, channels, flats and plate steel.

Two sets of punching tools are part of the unit's equipment; a high die block for punching webs and for flanges

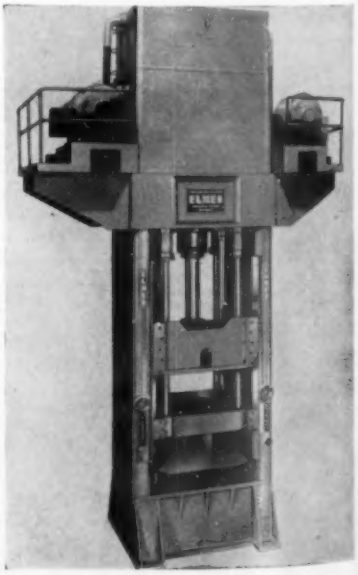
of 10 inches and larger beams and columns; a low die block for punching flanges of beams down to 4 inches.

A floating punch head permits setting the punch to idle up and down, barely touching the work on each stroke, leaving the operator's hand free to center the work under the punch. The punch may also be lowered to the center mark by a hand lever. T-2-1681

Hydraulic Press

Elmes Engineering Div. of American Steel Foundries has designed a double-action, hydraulic drawing and forming press equipped with die cushion. It is a housing type self-contained, multiple-ram, moving-down press with preshrunk tie rods to give maximum rigidity and alignment.

Among its interesting construction features is the ring-type key positioning of press crown, bed, and housings. Use of eight ring-type keys assures constantly maintained all-directional alignment



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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-2-213	W. F. & John Barnes Co.	**Special Machinery and Equipment**—Booklet, "Coordinated Machine Engineering" describes modern machines and mass production techniques. (Page 212-213)
A-2-215	Behr-Manning Div. Norton Co.	**Abrasive Cloth**—Sixty-two-page "Production Digest Manual" contains cost and time-saving coated abrasive applications. (Page 215)
A-2-66	The Blanchard Machine Co.	**Surface Grinders**—Two booklets are available concerning Blanchard grinders—"Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding." (Page 66)
A-2-56	Brown & Sharpe Mfg. Co.	**Face Grinding Machine**—Complete information concerning the new No. 11 face grinding machine is available on request. Also "Pay As You Depreciate" describes the company's depreciation plan. (Page 55-56)
A-2-245	The Bullard Co.	**Vertical Chucking Machine**—Type L Mult-Au-Matic machine is discussed in catalog L. (Page 245)
A-2-229	Campbell Machine Div. American Chain & Cable Co.	**Abrasive Cutters**—Bulletin DH-301 discusses the principles of abrasive cutting. (Page 229)
A-2-244-1	Chicago Rivet & Machine Co.	**Riveter Machines**—Free catalog contains engineering information and rivet specifications plus illustrated descriptions of 26 Chicago automatic rivet setters. (Page 244)
A-2-27	Colonial Broach Co.	**Broaching Machines**—Bulletin FW-55 gives complete description of Colonial "4" convertible broach. (Page 27)
A-2-221	Composite Forgings, Inc.	**Forgings**—Booklet containing indexed weight tables, heat treatment, weights, circumferences of circles, etc. is available. (Page 221)
A-2-33	Delta Power Tool Div. Rockwell Mfg. Co.	**Drill Presses**—Catalog describes the new Delta 14-inch drill press line. (Page 32-33)
A-2-38	The Denison Engineering Co.	**Pilot-Operated Valves**—Bulletin VR-2C discusses a complete line of relief, sequence, unloading and pressure-reducing valves. (Page 38)
A-2-31	DeVlieg Machine Co.	**Boring Machines**—Comprehensive, illustrated catalog shows typical examples of jigless production on DeVlieg jigmils. (Page 31)
A-2-53	Dumore Co.	**Drill Units**—Specifications and functions of Dumore units are described in bulletin. (Page 52-53)
A-2-151	Ettco Tool Co., Inc.	**Multiple Head Drilling Machine**—Details of the Flex-Shaft adjustable spindle multiple head drill press are discussed in Bulletin 600. (Page 151)
A-2-43	Ex-Cell-O Corp.	**Special Machinery**—Details and advantages are available in "Way Machine Catalog." (Page 43)
A-2-239	The Fellows Gear Shaper Co.	**Gear Shapers**—"The Art of Generating with a Reciprocating Tool" discusses the design of gears and other parts. (Page 239)
A-2-69	Frauenthal Div. The Kaydon Engineering Corp.	**Turning and Grinding Machine**—Information on how the series 3100 precision turning and grinding machine gives production and toolroom advantages is told in booklet. (Page 68-69)
A-2-268-1	Genesee Mfg. Co.	**Facing and Counterboring Tools**—Catalog 54-T describes the inserted blade tools and their design features. (Page 268)
A-2-45	Giddings & Lewis Machine Tool Co. Davis Boring Tool Div.	**Boring Bars**—Two bulletins, DB-110 and 112 tell of the time-saving features of a new tooling idea. (Page 45)
A-2-175	Handy & Harman	**Silver Brazing Alloys**—Facts about Easy-Flo and Sil-Fos tell why these alloys are used today. Included also is information about joint design fast brazing production methods. (Page 175)
A-2-267	Hanna Engineering Works	**Hydraulic and Pneumatic Cylinders**—Booklet describes the control power of Hanna low-pressure cylinders. (Page 267)
A-2-60	Haynes Stellite Co. Div. Union Carbide & Carbon Corp.	**Alloy Steels**—"Haynes Stellite Metal-Cutting Tools" contains production data and advantages of Haynes steel. (Page 60)

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A-2-189	Heinrich Tools, Inc.	**Air Vises**—Catalog gives specifications, dimensions and applications of the complete line of Heinrich tools. (Page 189)
A-2-201	Hydraulic Press Mfg. Co.	**Hydraulic Components**—Bulletin 1101 tells the advantages of ordering component parts and of the savings derived. (Page 201)
A-2-193	Jacobs Mfg. Co.	**Chucks**—Construction and holding features of Jacobs' chucks are discussed in Catalog 100. (Page 193)
A-2-158	B. Jahn Mfg. Co.	**Dies**—"Story of B. Jahn Production Proved Dies" gives the facts of Jahn products. (Page 158)
A-2-67	The Carlyle Johnson Machine Co.	**Overload Release Clutches**—Advantages of Maxitorq overload release clutches are detailed in Catalog TE-2. (Page 67)
A-2-164	W. B. Knight Machinery Co.	**Jig Bore Machine**—Catalog describes No. 50 jig bore and other Knight boring and milling machines. (Page 164)
A-2-8	Landis Machine Co.	**Threading Machines**—Information concerning Landmaco leadscrew threading machines is given in Bulletin H-75. (Page 8)
A-2-11	The Lapointe Machine Tool Co.	**Broaching Machines**—Circular HP5-5 tells of the economies and accuracy of Lapointe machines. (Page 11)
A-2-171	Lavallee & Ide, Inc.	**Reamers**—An assist in buying and production planning is given in the booklet "Comparative Net Price Selector." (Page 171)
A-2-228-3	Lovejoy Tool Co., Inc.	**Metal-Cutting Tools**—Catalog 28 describes the complete line of Lovejoy tools. "Speed & Feed Calculator" is available on request. (Page 228)
A-2-64	P. R. Mallory & Co., Inc.	**Boring Bars**—Technical bulletin gives full data on how to utilize a new idea in tools you design. (Page 64)
A-2-220	M.B.I. Export & Import, Ltd.	**Machine Tools**—Illustrated brochure 100 describes the variety of machinery and attachments available. (Page 220)
A-2-182	Melin Tool Co., Inc.	**End Mills**—Price sheet and tool catalog are available on request. (Page 182)
A-2-222	Michigan Drill Head Co.	**Drill Heads**—Catalogs are available describing operations and features of Michigan drill heads. (Page 222)
A-2-251	Miller Fluid Power Co.	**Hydraulic Cylinders**—Bulletins H-104 and A-105 give a complete line of Miller high-pressure cylinders. (Page 251)
A-2-235	National Broach & Machine Co.	**Broaching Fixtures**—Bulletin B54-9 gives detailed information concerning the Red Ring self-contained broaching fixtures. (Page 235)
A-2-194	New York Air Brake Co. Dudco Division	**Fluid Motors**—Bulletin DM-301 describes Dudco Dual-Vane fluid motors. (Page 194)
A-2-178	C. A. Norgren Co.	**Machine Lubrication Systems**—Spray-Lube system on tapping machines is outlined in blueprint SL-4. (Page 178)
A-2-161	Reed Rolled Thread Die Co.	**Knurling**—"Knurl Data 50-10" describes circular and diametral pitch knurling. (Page 161)
A-2-183	Rotor Tool Co.	**Air Grinders**—The Rotor B-35 vertical air grinder is described in Catalog 40. (Page 183)
A-2-150	Sales Service Machine Tool Co.	**Presses**—Specifications, prices and complete line of Press-Rite machines are given in Catalog P-552. (Page 150)
A-2-173	The S-P Mfg. Corp.	**Hydraulic Cylinders**—High pressure cylinders are discussed in Catalog 104. (Page 173)
A-2-152-2	Standard Parts Co.	**Fixture Keys**—Economies of milling fixture keys and the description of other tool components are given in 66-page catalog. (Page 152)
A-2-260	Valenite Metals Corp.	**Tungsten Carbide Tools**—Catalog A-2 illustrates and describes the complete line of carbide tips and tools. (Page 260)
A-2-148	Vascoloy-Ramet Corp.	**Toolholders for Carbide Inserts**—Description of the new tool-holder system V-R inserts is contained in Catalog VR-435A. (Page 148)
A-2-227	Waldes Kohinoor, Inc.	**Internal Grooving Tool**—Twenty-page manual contains information on Waldes Truarc grooving tool. (Page 227)
A-2-273	Wales-Strippit Corp.	**Hole Punching and Notching Equipment**—Wales Catalog BL discusses the advantages and economies of Wales Equipment. (Page 273)
A-2-22	Wiedemann Machine Co.	**Turret Punch Presses**—RA-41P turret punch presses are described in Bulletin 241. (Page 22)

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of the three elements.

The multiple-ram arrangement permits a maximum flexibility of operation since great pressing speeds are available for work requiring less than maximum press tonnage.

Ease, speed and accuracy of operation are also advantages of this press design. The press stroke control and speed change adjustments are controlled from front of the press, at floor level, permitting the operator to make adjustments while the press is in action and to observe position of the ram while making adjustments. Manual, hydraulic bleed-off type inching control is provided for die setting, making possible control of slide movement to within a few thousandths of an inch.

Further details are contained in the Elmes "Presslines" metalworking bulletin available from the division, 1150-Z Tennessee Ave., Cincinnati 29, Ohio. **T-2-1711**

Gage

A production gage for use either at the machine or in final inspection has been developed by the A. G. Davis Gage & Engineering Co. The tool has a particularly sturdy construction without delicate or easily broken details.

In use, it will repeat to tenths under

difficult conditions. It is available for standard O ring and ring snap grooves with bores from 0.480 to 4.750 diameter.

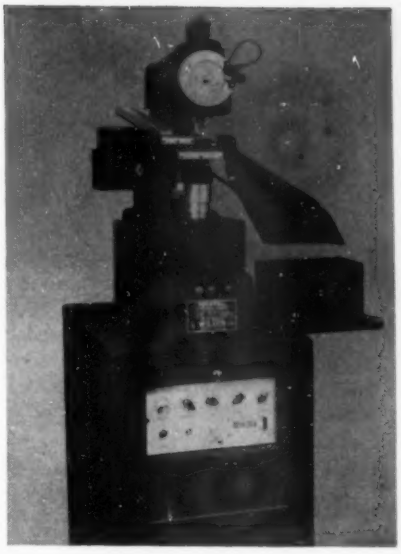
Complete details may be had from the maker manufacturer, 21435 Dequindre Dept. T., Hazel Park, Mich. **T-2-1712**

Automatic Hardness Tester

Wilson Mechanical Instrument Div. of American Chain & Cable Co., New York 17, N. Y., has announced an automatic Rockwell hardness tester that is capable of performing between 1000 and 1200 tests per hour, as opposed to the average 200-400 tests by manual testers.

The unit operates on the identical principles of the hand-operated tester, except it is fully automatic. Pieces being tested are power fed into the tester and automatically placed in position for testing.

Novel features of the unit include a control which regulates the up-and-down travel of the elevating screw so



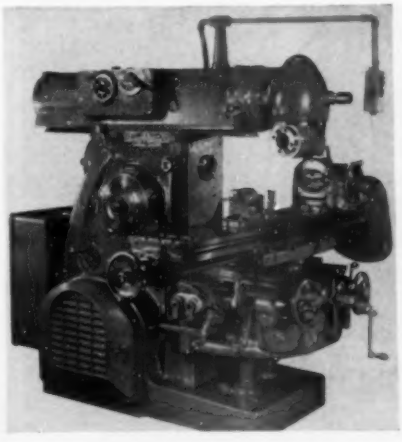
that pieces need not necessarily have the same thickness for automatic testing. A control also is available to limit the dwell at the end of the travel of the elevating screw. Another feature is a control on the length of time that the pointer remains at the correct hardness position.

Classifying is done by means of photoelectric units mounted on the bezel rings of the dial gage. These units may be set so that hardness limits as close as two points may be controlled. **T-2-1713**

Ram Head Millers

A line of ram head milling machines, so designed that they combine a conventional horizontal spindle and a self-contained motorized sliding ram for adjustable cutting heads, with a result that horizontal and vertical spindles can be run separately and simultaneously, is offered by Kearney & Trecker Corp., Milwaukee 14, Wis.

The ram head machines are available with a choice of three cutting heads—universal, vertical and quill types which



can be rotated through 360 degrees. Consequently, the user can perform vertical, horizontal and angular milling on one machine in a single setup.

They are highly versatile and unusually economical for general-purpose production milling. They are available in Model CH, CK and CSM designs, with 69 different working range combinations, and in sizes from No. 2 to No. 4 in both plain and universal styles. Machines may be equipped with either standard directional table control, or mono-lever with automatic cycle table control.

The ram head is individually motor-driven, has its own lubrication system and speed-change mechanism. When used as a standard horizontal machine, the ram acts as a heavy-duty arbor support. **T-2-1721**

Carbide Inserts

Kennametal Inc., Latrobe, Pa., has now included in its Kendex line a low-cost type of tungsten carbide tooling that utilizes "throw-away" carbide inserts which may be turned over and used on each side prior to disposal. It eliminates grinding in the user's shop, cuts cost per cutting edge, provides a system of chip control, and may be indexed in seconds.

This tooling is provided in two types: button, which uses a removable chip-breaker, and the heavy-duty line, on which a hardened clamp serves as a chip deflector.

Button tools with square or triangular tungsten carbide buttons are available in two finishes: "regular," which are molded to size with the nose radii and

top and bottom surfaces ground, and "precision," which are ground all over for accurate on-the-job indexing.

Heavy-duty Kendex tools are furnished with rectangular carbide inserts having a 15-degree lead angle and parallelogram-shaped carbide inserts for cutting to a shoulder. Only "regular" inserts (molded to size with corner radii, top and bottom ground) are furnished in the heavy-duty tool line. Inserts are ground to index within plus or minus 0.005-in. **T-2-1722**

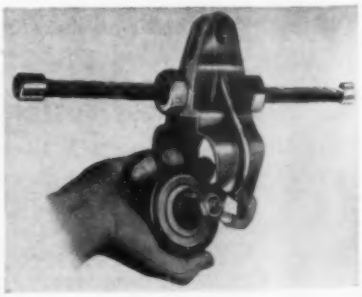
USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Conveyor Line Bracket

American Cable-Link Co., 13446 Fenkell Ave., Detroit 27, Mich., has designed an unusual bracket, for use in the trolley assembly for the company's overhead conveyor systems.

The patented bracket incorporates a removable wheel feature that permits wheel changes without dismantling or removing trolley from the monorail.

The feature of this bracket is the hook design at the top of the bracket arm. By loosening the retaining nut on the wheel, it can be removed easily



through the opening in the bracket hook. In the same way, the replacement trolley wheel can be slipped quickly through the opening in the hook of the A C-L bracket. Once the wheel retaining nut is tightened, the trolley wheel will remain securely fixed in proper position indefinitely regardless of conveyor travel speed, suspended load or pull load. **T-2-1723**

Vacuum Gage

A vacuum gage operating on a-c current is now offered by Naresco Equipment Corp., equipment sales subsidiary of National Research Corp. The gage, called the Model 517 Alphatron, offers several features:

With six ranges it can measure pressures from 1000 to 0.0001 mm. Hg. on a linear scale.

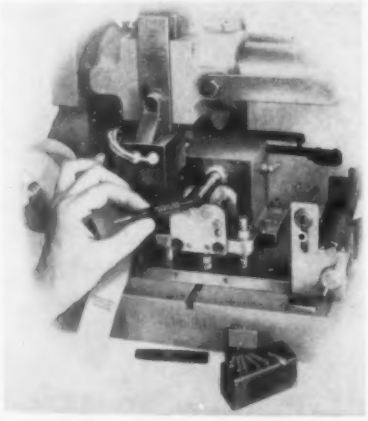
It gives instantaneous response, for quick readings.

Compactly constructed, it is lightweight.

The unit utilizes a sealed radium source; this emits alpha particles and produces ionized gas molecules which are collected on a plate to produce a current indicating directly the measured pressure. The gage cannot be damaged by exposure to atmospheric pressure because the ion source operates at room temperature and at zero potential. **T-2-1731**

Marker for Tubes

A combination fixture for marking tubular parts is offered by The Acromark Co., 607 Morrell St., Elizabeth, N. J. This fixture is best utilized in the Acromark Model 9A series machines or can be adapted to use in other types of



equipment. It is equally effective on plastic and directly upon tubular metal parts.

An interchangeable type or die holder used in either a cold or heated head is provided; and the head can be had with or without standard cylindrical heating elements for desired heat application. The holder will receive up to three lines of interchangeable lettering, interchangeable type or dies. Marking can be applied either lengthwise or crosswise of the part.

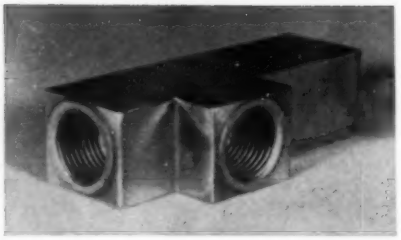
Unit dimensions are approximately 10 inches wide by 10 inches deep with a total height of about 5 inches, exclusive of the upper holder which would fit into the ram or marking holder of the marking machine. **T-2-1732**

Bleeder Valve

Automatic self-bleeding valves for hydraulic systems have been introduced by Radial Metal Products, Inc., 1044 Linwood St., Brooklyn 8, N. Y. They constantly and automatically bleed air out of a hydraulic system while the system is in operation and apply automotive, aircraft and industrial brakes, machine tools, aircraft and all other devices utilizing hydraulic power.

Manual bleeding operations are unnecessary, both at the time of initial installation, and throughout the working life of the system. These valves allow for efficiency and safety of the hydraulic system by assuring "incompressibility" of the hydraulic circuit at all times.

Valve connections are made adjacent



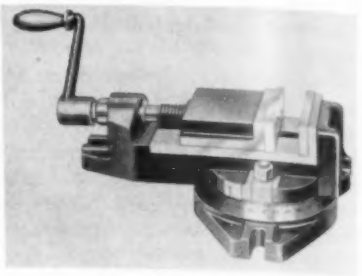
to the entrance ports of the hydraulic cylinders. Two valves are required for every double acting cylinder, and one valve for a single acting cylinder. On hydraulic brakes, only one valve is required for the entire system. Hydraulic tubing, suitably connected to these valves, completes the installation.

They are made for all standard-sized lines, and for all pressure ranges.

T-2-1741

Swivel Vise

An advanced screw swivel vise for milling machines, shapers and drill presses has been introduced by the Modern Tools Div. of the Nelco Tool Co., Berlin, Conn. Of particular interest are the patented covers that prevent chips from falling into swivel slides; hardened and ground removable jaws; and semisteel castings throughout to ma-



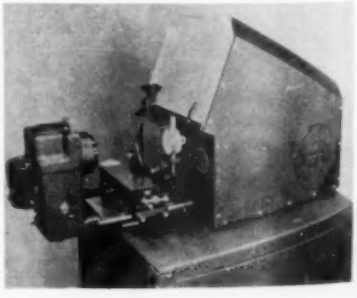
terially increase vise strength. The vise has a graduated swivel base; keyways in the body and swivel base permit use with or without base. The body is parallel and square to keyways.

It is available in these jaw dimensions: width 4 inches, depth 1½ inches, maximum opening 3 inches; width 6 inches, depth 2¼ inches, maximum opening 5¾ inches with keyways ⅝ inch wide, ⅛ deep. Special jaws obtainable upon request. **T-2-1742**

Optical Comparator

An economy size duplex type universal optical comparator has been announced by the Portman Instrument Co., Inc., Town Dock Rd., New Rochelle, N. Y.

The compact design of this comparator incorporates the basic features re-



quired for both toolroom or production line inspection. It may be used on a shop bench or stand in either a vertical or horizontal position. This dual design features allows parts to be positioned in either plane for maximum efficiency.

The slide type insertion screen frame has been designed to accommodate standard 8½ by 11 inch overlay charts and is provided with retainer rails and

screen cl... The large plain platform type sta... measures 5 by 7 inches.

Lenses ... provide magnifications of 10, 15, 2... 25, 31¼ and 50X are obtainable ... standard equipment.

Accesso...es include a completely universal coo...linate measuring stage with dial indica...rs; angular position center stage; gree... or orange color filters; and optiona... thermo blower unit.

T-2-1751

Wet-type Dust Collector

A wet-type dust and fume collector based on a new operating principle has been developed by Van-Truer Co., Inc., 12600 Beech Rd., Detroit 23, Mich. It consists of a cylindrical drum with a series of cones and baffles.

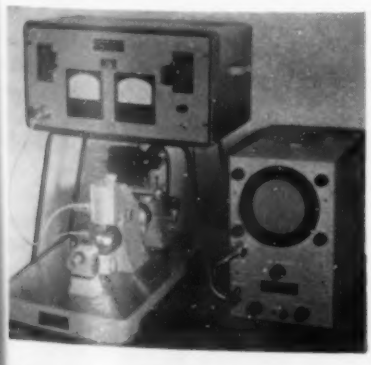
Dust and fume-laden air flow upward through the dust collector, filtering through a series of "water curtains" in the travel. Baffle design of the unit sets up a cyclonic washing action and turbulence, separating the wet dust and carrying it to the sludge tank below. Saturated air continues up through two-stage moisture eliminator and emerges dry.

The design of the Van-Truer dust and fume collector incorporates a flat bottom which serves as a settling tank from which the water is recirculated. A chute type of clean-out is provided for easy hand clean-out. T-2-1752

Ball Wavometer

Micrometrical Development Corp., 2821 S. State St., Ann Arbor, Mich., announces an inspection instrument, called the Ball Wavometer, for measuring the waviness of balls from 1/16 to 1¼-inch diameter.

This instrument shows the rms average height of the irregularities in surface contour that occur from 3 to 100 times around a major circumference of the ball. The readings are shown by a meter for each of two wave-bands, in microinches. A range selector switch for each wave-band provides full-scale readings of 1, 3, 10, 30, 100 and 300



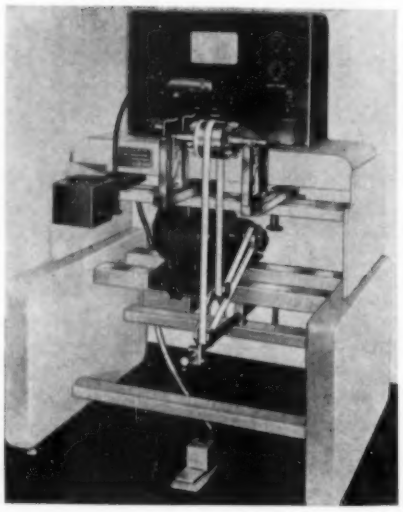
microinches. An oscilloscope, to show the general shape, spacing, and approximate number of waves in either waveband, is an optional addition.

Further details are given in Bulletin B-1, available from the manufacturer.

T-2-1761

Balancing Machines

A Beko balancer series of nine heavy duty, general purpose, static and dynamic balancing machines for small and medium size rotors has been made available by Balance Engineering Co., Mac Dell Sales Div., 850 W. Lake St., Chicago 7, Ill. Primary feature of the balancers is their simplicity of operation



to permit use by unskilled operators of this type equipment.

Working areas and controls are designed for optimum operator convenience making possible high production rates on close tolerance work. Magnitudes of unbalance are positively indicated on a large meter directly in terms of unbalance correction procedure selected. Only three pushbutton switches control all indications.

Floor vibration does not affect machine operation. Units have been used to indicate unbalance corrections necessary to reduce rotor vibrations to 20 millionths of an inch. All models are adaptable and may be set up quickly for a wide range of rotor sizes and shapes and are availble in both floor and bench mounting types. **T-2-1762**

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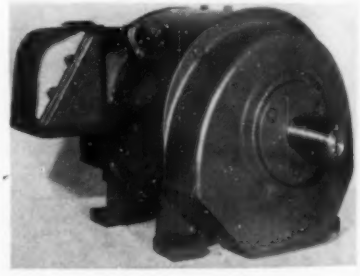
D-C Motors

Industrial direct-current motors have been developed by the Reliance Electric and Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio, that feature as a primary advantage, Dynamic Response—or unusually fast and accurate response, as opposed to the ordinarily controlled reaction of motors to the demand for a change in performance.

This Dynamic Response has been built into the Super 'T' d-c motor to



meet growing demands for automation. The design further features durability, ability to take full load and overloads, ability to change speed rapidly, ability to maintain torque and tension, and to reverse and to stop quickly.

Time required for the Super 'T' to accelerate to full speed has been cut to half the time that was formerly required. Lower mechanical inertia, lower electrical inertia and higher commutating ability have been combined in the unit.

The line is being produced in the sizes from 20 to 100 hp, and the range will be extended both upward and downward to higher and lower horsepowers. A complete range of mechanical enclosures has been developed. **T-2-1763**

Field Notes...

Consider Standard Changes for Splines

Important changes in standards for involute splines have been decided upon by the Technical Committee B5-13 of the American Standards Association, and are now being drafted in form to be submitted for simultaneous approval to both the SAE and the ASA Sectional Committees.

The revisions fixed upon by the group are these:

Delete the minor diameter fits.

For the flat root only, change the dedenum of the internal to $1/P_d$. (Reciprocal of the stub pitch.) This carries with it the decision to modify the major diameter of the external as needed.

Apply form clearance for both external and internal.

Delete specifications for flat root fillet radius and have values in a table for reference.

Delete the loose and press fits on the major diameter (Class I and III.) Major diameter fits will be listed only through 12/24 pitch.

Delete the standard listing of the press fit on the sides of the teeth (Class C). Press fits vary so much that they do not belong in the Standard. A special section will recommend procedure.

Change definitions and symbols to agree, where possible, with latest standards on nomenclature.

Delete the use of flatted pins and use round pins of larger diameter, as in the Gaging Standard.

Incorporate with the revision, the Standard on Spline Gaging (B5.31) with revisions which may be necessary because of the above changes.

Make pin measurements optional and reference, because with good gaging practice, the space width and tooth thickness are the required specifications. (Tables of pin measurements will be included in the standard.)

In addition to these decisions, the Committee also is giving some consideration to revision of the Involute Serration Standard paralleling those being considered for the Spline Standard. Prime among the revisions being studied is that concerning machining tolerances, error allowances and fitting clearances. In order to determine tendencies of manufacturing and inspection today, the group is now studying data from many users.

Yet another phase of the question being studied is appropriate error allowances for broached internal splines. Some studies are being made of the tolerances of Class 4 of the Gear Inspection Standard.

With the decision made to include the gaging standard, some of the discussion of gaging systems will be transferred to the spline standard, because it contains design recommendations. This will enable the designer to tell the gage engineer what fits are desired and consequently save time in getting appropriate gaging.

Norton Co. has formulated a plan to provide for leasing, rebuilding, trading-in and time payment arrangements to be made on some of its standard grinding and lapping machinery. Particulars about the program are expected to be announced soon.

The leasing arrangement, according to a company announcement, will be similar to that used by Kearney & Trecker Corp., including their plans A, B and C. The rebuilding operations, which are being expanded, will provide opportunity for a company to have certain equipment rebuilt for a firm price of 45 percent of the price of a corresponding new machine. The trade-in program is designed to permit companies interested in carrying on replacement programs to gain the advantage to be had if original equipment can be offered in trade for new machines.

Time payments are arranged for purchase of new machines. Such arrangements will be handled through distributors, and will be limited to machines designated as available for lease.

v v v

Dedication ceremonies of a new headquarters building were held by the American Foundrymen's Society in Des Plaines, Ill. The building project, representing an investment of about $300,000, was dedicated to American industry since it will house the country's first foundry technical center and will become a focal point from which technical activities will emanate on an international scale.

v v v

Production of electrolytic manganese has been started by Electro Metallurgical Co., Div. of Union Carbide and Carbon Corp., at the new plant at Marietta, Ohio. Capacity of the plant is expected to be about 6,000 tons a year when all the electrolytic units are in full operation.

The electrolytic process being used by Electromet produces minimum 99.9 percent pure manganese metal in plate form about ⅛-in. thick.

purchases

Ueber Tool and Mfg. Co. of Detroit has been acquired by Lunn Laminates, Inc. Purchase of the tool and die facility indicates entry of Lunn into that industry as a major step in an earlier announced expansion program. Ueber Tool will operate as a wholly owned subsidiary under the direction of Kurt Petrasch as general works manager. The transaction makes Lunn the first of the reinforced plastics fabricators to offer a complete tool and die service employing all forms of dies including steel, plastics or a combination of the materials.

v v v

Exclusive world-wide sales representation for all Hygrade Atlas Inc. products for metal finishing has been acquired by The United States Hoffman Machinery Corp. The new Hoffman enterprise will be known as the Hygrade Metal Finishing Div.

v v v

The product line, patents, inventories and business of Rensselaer Valve Co. have been purchased by The Ludlow Valve Mfg. Co. subject to approval by the stockholders. Purchase price was not announced. The Ludlow company, it was stated, will expand its present facilities and be in position to serve more efficiently both Rensselaer and Ludlow customers.

anniversaries

This year marks the diamond jubilee of precision toolmaking by The L. S. Starrett Co. During the 75-year history of the company, the firm has expanded from a room in a small ma-

chine shop to the present world's largest manufacturing plant devoted exclusively to production of mechanic's hand measuring tools and precision instruments and like tools. The present catalog offers more than 3000 items.

The company was founded in 1880 by Laroy S. Starrett who at that time invented and began to manufacture the combination square. Mr. Starrett, through his inventive skill, became one of the pioneers who made possible modern methods of dimensional control in production and inspection.

V V V

National Broach & Machine Co. is celebrating its 25th year of operation. The company, which originated the rotary crossed axis gear shaving process, was incorporated in November 1929. Its founder, the late R. S. Drummond, bought National Broach Co., a Dayton, Ohio, firm, moved it to Detroit to form the company under its present name.

From a modest beginning, the company has grown through several expansion programs until it now occupies thirteen times the floor space of the original building in which it started operations.

new activities

Sinclair-Collins Valve Co. and Valvair Corp. have announced opening of a new plant in Canton, Pa. The new firm, which will operate under the manufacturing name of Collins Valve, Inc., will serve as a main production center for eastern customers while the present location of Valvair and Sinclair-Collins will be the main production centers for the midwest and western customers. Engineering sales and administrative offices will remain in Akron Ohio. The new organization will be in production February 1.

V V V

Formation of Campbell Engineering Co. with offices at 9320 Michigan Ave. Detroit 10, Mich. has been announced by its three partners, Charles C. F. Ownen, Thomas J. F. Papez and Charles C. Wieder, all former engineers with the H. F. Campbell Construction Co.

V V V

A California sales office has been established by E. W. Bliss Co. at 816 N. Hollywood Way, Burbank. M. Frank Strauss and Donald C. Walker, who have represented Bliss in the area for many years, joined the company to man

the Burbank office. Jack V. Harris continues as sales engineer for the northern part of the state, and Star Machinery Co. will still handle Bliss sales in the Pacific Northwest. The company recently launched manufacturing operations at San Jose.

V V V

Overseas sales activities of F. J. Stokes Machine Co. are now being administered and controlled by a new International Div. of the company established at Stokes' headquarters 5500 Tabor Rd., Philadelphia. Although sales will still be handled through local representatives throughout the world, the new division will enable the company to establish closer control and better relations with those representatives, company announcement pointed out.

V V V

A Canadian subsidiary of Eclipse Fuel Engineering Co. has been established at 20 Upjohn Rd., Toronto. The plant, Eclipse Fuel Engineering Co. of Canada, Ltd., will occupy a new 10,000 sq ft facility. It will be under the direction of Bert H. McGill, newly appointed president and general manager of the subsidiary.

name changes

Announcement of a change of name from Weltronic Induction Heating Corp. to Welduction Corp., has been announced by C. J. Cullom, president of the firm. He indicated that both ownership and management would remain unchanged. The corporate change was made for the sake of simplicity.

V V V

Daubert Chemical Co. is the new name for the Nox-Rust Chemical Corp. The change was made because of diversification of products and the name of Daubert was chosen after the company's president George A. Daubert.

V V V

According to company announcement, the name of The Sterling Abrasives Div. of The Cleveland Quarries Co. has been changed to Sterling Grinding Wheel Co. It now is operated as a wholly owned subsidiary of the Abrasive and Metal Products Co.

V V V

Assets of The Mettler Co., Inc., of Los Angeles have been acquired by the Eclipse Fuel Engineering Co. It will continue to operate as The Mettler Co.,

Inc., Div. of Eclipse Fuel Engineering Co. through the present sales organization and all manufacturing and sales will be handled in the West Coast offices and plant.

V V V

Bendix Foundries is the new name for the former Eclipse-Pioneer Foundries division according to an announcement by the Bendix Aviation Corp. Reason given for the change was to emphasize the division's policy of serving needs of a wide range of industrial customers in a variety of fields.

expansions

Construction is nearing completion on an expansion of the manufacturing plant of The Bristol Co. Besides manufacturing facilities, an expansion in office space is being carried out to provide added room for the engineering and research departments.

Two new buildings just completed and put in use for Bristol are office buildings to house the application engineering department and the socket screw sales and application departments.

V V V

Westinghouse Electric Corp. has announced its plans to build a new $12½-million jet engine research and development facility. The new plant, which will include both high and low-power laboratories and an experimental engineering shop, will be located at the present site of the huge 80-acre jet engine plant south of Kansas City. The laboratories will provide for research and development testing on components of new jet engine designs and for development of improvements in existing jet engines. The experimental shop will manufacture newly designed components as well as complete experimental engine models.

The entire operation will be part of the division engineering department and will be under the supervision of Allan Chilton, chief engineer.

V V V

Announcement has been made of another addition to Leeds & Northrup Co. Construction has started on the company's new plant at North Wales, Pa., near Philadelphia. Cost is expected to run near $2,750,000. The 254,000 sq ft plant will house manufacturing space, office area and personnel facilities. Besides the main plant there will be power plant buildings. Occupancy is scheduled for winter of 1955-56.

Technical Shorts...

Create Aluminum Forging Alloy

AIRCRAFT DESIGNERS particularly will find an immediate use for the high strength aluminum forging alloy recently perfected by Aluminum Co. of America. The new alloy called, X7079, offers greater uniformity of properties which aircraft manufacturers will find especially useful for making heavy sections. In addition, the alloy affords increased ductility in cross grained directions.

At present, X7079 production, which is a member of the aluminum, zinc, magnesium, copper series of alloys, will be limited to forging applications. Future uses possibly will include wrought aluminum products, such as heavy plate and extruded sections.

Further attributes of the new alloy include less quench sensitivity than high strength alloy 7075 (75S), and less susceptibility to distortion when machined than are forgings of 7075. Other advantages become apparent in die and hand forgings heat treated in sections more than three inches thick in which higher and more uniform mechanical properties develop.

As a result of the improved characteristics of the alloy, Alcoa has been able to establish guaranteed mechanical properties in die and hand forgings in section thicknesses up to 7 inches in the solution heat treated and artificially aged condition, X7079-T6.

* * *

Films for Engineers

TWO TECHNICAL automatic sound slide films have been released by The Sheffield Corp. Both films are of an educational nature and are designed to be viewed by engineering and production audiences. The first film, "Machining the Unmachinable", presents details concerning a process for machining the hardest of materials by using ultrasonic energy with the company's Cavitron machine. Running time for this picture is 16 minutes.

Second of the two films is "New Horizons for Quality" which discusses the application of the Sheffield's Plunjet, versatile air gaging cartridge, to machine control, multiple dimension inspection and other work. Running time for this film is 14.5 minutes.

Try Gas Turbines For Arc Welding

WHAT IS CONSIDERED the first arc welder to use a gas turbine as a prime mover has been developed by Hobart Brothers scientific research division at Troy, Ohio. The DC welding generator of 250 amp capacity was successfully operated and tested under actual working conditions. Research into the gas turbine field was in connection with a study aimed at finding what possibilities exist there that would aid in building more compact and lighter weight equipment.

Not a commercial venture, the development was created as part of a continuous program calculated to keep the company abreast of the fast changing world of engineering and equipment.

Reduction of weight and size, which would be possible if the gas turbine proves feasible, would be decided advantages and might bring this source into being as the prime power of tomorrow. The company has built many jet engine starters for the U. S. Air Force and other manufacturers using the conventional internal combustion engine. Hobart researchers now wonder if the turbine type of power may be their answer to lighter air-borne equipment that could be transported easily in smaller aircraft instead of in the presently used cargo plane.

Men at Work . . .

New officers elected to head activities of Reed-Prentice Corp., recently acquired subsidiary of Package Machinery Co., included **Roe S. Clark** as chairman of the board, **Roger L. Putnam,** president, **Frederick W. McIntyre, Jr.,** vice-president in charge of sales and **Jackson R. Holden,** secretary and clerk. **Donald H. Dalbeck, Iver G. Freeman** and **Douglas L. Brennen** will continue as vice-president and treasurer, vice-president and assistant treasurer respectively. Mr. McIntyre and Mr. Freeman are members of ASTE's Worcester chapter.

The recently established branch of Stainless Processing Div. of Wall Colmonoy Corp. at Morrisville, Pa., is to be headed by **John Kozelski** as general plant manager. Mr. Kozelski, who previously was eastern representative for the division, is a member of Paterson chapter of ASTE.

Appointments announced by Michigan Tool Co. made **A. D. Moncrieff** manager of the machine tool and cutting tool divisions and **Clayton E. Scott** chief engineer. At the same time, the appointment of **Charles R. Staub** as staff consultant was announced. Mr. Moncrieff, who has been with Michigan Tool since 1933, has been on special executive staff assignments for the past year. Mr. Scott, who has been associated with the company for 10 years, was previously assistant chief engineer. Mr. Staub joined Michigan Tool in 1929. A pioneer in the development of modern gear production methods and machines, he has been the company's chief engineer since 1936. Mr. Moncrieff and Mr. Staub are both members of ASTE's Detroit chapter.

At the recent annual meeting of the Automotive Parts Manufacturers Assn., **Goodloe H. Rogers,** president and general manager of the American Forging and Socket Co. was elected president to serve for the coming year. Other officers elected were **Guy S. Peppiatt,** president of Federal Mogul Corp., vice-president; and **John W. Dixon,** vice-president of Clevite Corp., secretary-treasurer.

Three appointments made public by Allis-Chalmers Mfg. Co. included **Martin L. Carson,** who has been placed on special assignment in the office of the vice-president in charge of general machinery division; **L. W. Long,** who was named general manager of the Terre Haute Works; and **John F. Chipman,** who was made general manager of the Boston Works.

Joseph F. Quaas has been promoted to position of director of manufacturing and production for Eutectic Welding Alloys Corp. He formerly was manager of the Electrode Production Div.

E. Hugh Jones is new operations manager of the Lima and Fostoria plants of Ex-Cell-O Corp., while **Richard A. Lodge** has been made assistant sales manager in charge of sales at the same plants. Mr. Jones during the past two years has been in charge of the company's jet blade and rotor production. Mr. Lodge has been associated with the firm's aircraft operations.

Edwin J. Schwanhausser, previously executive vice-president and member of the company's board of directors, has been elected president of Worthington Corp. He has been with that company since 1915.

J. F. McRoberts has been named vice-president and general manager of the Progressive Welder Sales Co. Mr. McRoberts has been assistant to the president of the firm since becoming associated with it in 1953.

John C. Molinar has been elected vice-president of Niles-Bement-Pond Co. and also has been appointed general sales manager of the company. Mr. Molinar is a member of Hartford chapter of ASTE.

Edwin C. Evans has been made vice-president and assistant general manager of Behr-Manning Corp. Associated with the firm for more than twenty years, he became a director in 1953 and a vice-president in 1954.

At the same time Edwin J. Schwanhausser was elected to the position of president of Wortthington Corp, **Hobart C. Ramsey**, who formerly served as president, was made chairman of the board. He succeeded Howard Bruce, who was elected chairman of the executive committee. Mr. Ramsey will continue as chief executive officer.

In addition it was announced that **Clarence E. Searle** is retiring as vice-chairman of the board. He will continue as a director.

At a board meeting of directors of Ex-Cell-O Corp., **Omer E. Robbins** was elected a director of the firm to fill the vacancy created by the death of Leslie M. Johnson. Mr. Robbins' business career has been primarily concerned with the Robbins Engineering Co. which he organized. The company was acquired by Ex-Cell-O in 1948, and Mr. Robbins continued as its president until his retirement from active duty in 1951.

According to announcement from The Cleveland Crane & Engineering Co., **Roy Dehn** has been made director of engineering, a position created to integrate the engineering activities of the company. Mr. Dehn, who has been with Cleveland Crane since 1937, was previously chief engineer of the heavy machinery division.

Boyd M. Johnson, formerly assistant general manager of the Refractories Div. of The Carborundum Co., has been named general manager of the division to succeed Clarence E. Hawke who retired from its active direction. Mr. Hawke, as a vice-president of the company and special consultant to the president, will now give particular attention to development and marketing of the firm's Fiberfrax ceramic fiber.

Maurice J. Day has been made director of research and development for Crucible Steel Co. of America. Dr. Day formerly was associated with Armour Research Foundation of Illinois Institute of Technology.

Later, the company also announced appointment of **Albert C. Redding** as technical and development engineer to its central operating staff. Mr. Redding was previously production manager of the Kidd Drawn Steel Co.

Several top management changes have been announced at the C. A. Norgren Co. **C. Neil Norgren**, who was vice-president and assistant general manager, has been advanced to the newly created post of executive vice-president; **Delbert G. Faust**, chief engineer for the past five years, is now vice-president in charge of sales and advertising; **Leigh H. Norgren**, previously treasurer and assistant secretary, was made vice-president in charge of engineering and production. **George L. King** who has served as office manager and general counsel, has been named the new treasurer, while **J. A. Wilson**, formerly assistant chief engineer, was appointed chief engineer to succeed Mr. Faust.

Hjalmar Nilsson, plant engineer of the Magnesium Co. of America since 1947, has now been named chief engineer of the company.

William I. Clark has been made assistant to the president of Behr-Manning Corp. His new position is in addition to his previous responsibilities as secretary of the company. Mr. Clark, who has been associated with Behr-Manning since 1933, was elected a director of the company about three years ago. He was chairman of the operating board in 1952 and 1953.

The Elwell-Parker Electric Co. has announced the appointment of **J. A. Ackermann** as chief engineer. A veteran of 31 years with the company, he has been assistant chief engineer since 1946.

Two promotions at Hamilton Standard, division of United Aircraft Corp. involve **Edward M. Bancroft**, formerly a tool designer, who was made master mechanic of the division, and **John E. Bateman**, formerly assistant chief tool engineer, who became chief tool engineer.

Wallace E. Anderson was named general sales manager of Brown & Sharpe Mfg. Co. effective Jan. 12. At the same time, it was announced that **Paul R. Hatch**, vice-president and sales manager had resigned.

Trade Literature

For Free Booklets and Catalogs—
Convenient Request Card on Page 169

Stampings

Four-page leaflet, Bulletin 201, deals with quality stampings in small quantities; includes quick summaries of cases where short-run stampings might be used profitably, and typical examples to illustrate tooling costs; also offers information on factors that cut costs of stampings. Federal Tool & Mfg. Co., 3600 Alabama Ave., Minneapolis 16, minn. **L-2-1**

Nickel Alloy Chart

Engineering properties of nickel alloy wire, rod and strip, large wall chart which folds to file size booklet; itemizes physical, mechanical properties and chemical compositions, describing nickel, Monel, Inconel, Incoloy and nickel-clad copper. Alloy Metal Wire Div., H. K. Porter Co., Inc., Prospect Park, Pa. **L-2-2**

Tool Steels

Chart shows comparable tool steels, listing by brand names under 12 leading steel mills; gives general classification, SAE number, AISI number and JIC number for 15 different types of tool and die steels. Uddeholm Co. of America, Inc., 115 E. 44th St., New York, N. Y. **L-2-3**

Gage Units

Sixty-four page illustrated Catalog No. 8 offers comprehensive information on company's standard gage units for process and design engineering; includes descriptions, engineering drawings and data, typical examples, and selector guides for standard gage units, indicator depth gages, flush pin gage blanks, internal groove diameter gages and special gages. A. G. Davis Gage & Engineering Co., 21435 Dequindre Rd., Hazel Park, Mich. **L-2-4**

Hard Facing

Four-page illustrated brochure describes Spraywelder (a metal powder spraying unit) used in welded overlay type hard facing applications, and the Sprayweld process. Describes the unit, alloys available for use in it, explains basic operations in the process, lists typical applications. Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich. **L-2-5**

Induction Heat Control

"Automatic Temperature Control for Induction Heating Equipment", Bulletin HT-1 covers automatic temperature subject in a way to clarify the role of automatic control in its application on induction heating equipment; illustrated by diagrams. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa. **L-2-6**

Lubricants

Four-page Bulletin 103, "Fringe Area Lubrication with Molykote Lubricants," explains the participation of Molykote lubricants in extreme pressure or boundry lubrication fields. Lists eleven major types of the lubricant, describing their ingredients, working temperature ranges and their method of applications. The Alpha Corp., 65 Harvard Ave., Stamford, Conn. **L-2-7**

Die Casting

Illustrated 28-page booklet, "Die Casting—Molten Metal to Finished Part—Direct", describes die casting process and its applications; pictures show basic steps of the operation; includes concise descriptions of dies and machines used. Discusses zinc, aluminum, magnesium and copper base die casting alloys. Outlines advantages, limitations, pertinent data on castings. American Zinc Institute, Inc., 60 E. 42nd St., New York 17, N. Y. **L-2-8**

End Mills

Folder describes line of helical carbide tipped end and shell mills; includes specifications, design and applications and prices. Wendt-Sonis Co., Hannibal, Mo. **L-2-9**

Work Facilities

Brochure offers itemized outline of company's facilities for making precision tools and production parts; illustrated. Rockford Die & Tool Works, Inc., Rockford, Ill. **L-2-10**

Cam Clutches

Line of cam clutches for indexing, overrunning and backstop applications covered in reference file C11-54A of catalogs giving general information, discussing operating functions, design features; illustrated. Morse Chain Co., 7601 Central Ave., Detroit 10, Mich. **L-2-11**

Vacuum-melted Metals

General information and technical data on vacuum-melted metals and alloys presented in technical bulletin VM-100; also discusses commercial services available regarding these metals. Carboloy Dept., General Electric Co., Detroit 32, Mich. **L-2-12**

Variable Speed Drive

Bulletin K-100 describes and illustrates company's speed Variator, a simple compact drive that gives infinitely variable output speed. Shows construction, and outlines operation and advantages. The Cleveland Worm & Gear Co., Speed Variator Div., 3249-59 E. 80th St., Cleveland 4, Ohio. **L-2-13**

Powder Metal

Leaflet presents data on Steel Oilite, a sintered material for metal powder uses; covers physical properties, applications and advantages; illustrated. Chrysler Corp., Amplex Div., Detroit 31, Mich. P. O. Box 2718. **L-2-14**

Electrical Control Maintenance

"Electro-Graphic Detector Systems" describes recent development that simplifies maintenance of complex electrical controls; covers general design principles operation, variety of applications and advantages; illustrated with line drawings and photos. W. F. & John Barnes Co., Electrical Div., 301 S. Water St., Rockford, Ill. **L-2-15**

Face Grinders

Company's unusual Besly-Bowen two-table radial head face grinders for continuous high production grinding discussed in 20-page Bulletin 700; covers principle of its design, production cycle during automatic grinding, special features and advantages. Well illustrated. Besly-Welles Corp., Beloit, Wis. **L-2-16**

Slitting

Illustrated 28-page manual offered as basic guide for new operators of slitting machines describes equipment, setup procedures, care of equipment and useful hints from practical experience. The Ohio Knife Co., Dept., U-36, Cincinnati 23, Ohio. **L-2-17**

Engineering Irons

Basic reference Bulletin A-69 offers guide to selection of engineering nickel alloyed cast irons; discuss characteristics and properties of these materials, their broad industrial uses, engineering properties and their advantages. Well illustrated. The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. **L-2-18**

Welding

Set of literature designed to help those concerned with production and maintenance welding; covers line of Murex electrodes for arc welding plus rods and wire for gas, submerged arc and inert arc, giving properties, chemical analyses, qualifications, procedures, sizes and general engineering data. Metal & Thermit Corp., 100 E. 42nd St., New York 17, N. Y. **L-2-19**

Vibration Mounts

Four-page illustrated brochure shows and describes company's line of mounts for shock and vibration isolation; also lists technical articles available on various aspects of these shock and vibration problems. Barry Product Digest, Dept. P, Barry Corp., 1000 Pleasant St., Watertown, Mass. **L-2-20**

Expanding Mandrels

Line of precision universal expanding mandrels presented in 4-page illustrated folder emphasizing simplicity of operation and advantages; other includes specifications. The LeCount Tool Works, Inc., 390 Capitol Ave., Hartford, Conn. **L-2-21**

Grinding

Company's Type H plain grinder for precision cylindrical grinding presented in detail in 16-page catalog telling how it works, what it does, its advantages; extensively illustrated. Landis Tool Co., Waynesboro, Pa. **L-2-22**

Fluid Power

Complete line of fluid power pumps, motors, transmissions, cylinders and valves treated in illustrated 12-page bulletin 10051-D; includes specifications and outline of main features and applications. The Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis. **L-2-23**

Mandrels

Illustrated brochure presents additional lines of push and pull type simplified expanding mandrel, outlining design features, application, specifications, and special types; illustrated. The E. Westberg Corp., 2015 Teall Ave., E. Syracuse, N. Y. **L-2-24**

Cold Pressure Welding

General information brochure describes Koldweld process for nonferrous metals; covers special tools for lap-welding and buttwelding; explains applications in detail, with photos to illustrate data on tools and dies, weldable materials results of lab tests and samples of industrial work. Utica Drop Forge & Tool Corp., Utica 4, N. Y.
L-2-25

Beryllium Copper

Illustrated 48-page publication offered as authoritative guide to use of beryllium copper pressure-cast cavities and cores in various applications; such as injection and compression molding, zinc die casting and stamping dies; presents easy-to-read factual data of interest to production men. Photos, drawings and diagrams help to clarify text. Free to those engaged in stamping, molding and related activity; request only on company letterhead directly to Manco Products, Inc., P. O. Box 5231, Detroit 35, Mich.

Machining

Brochure presents company's 1955 Manufacturing Program, showing lathes, automatic screw cutting machine, gear driven shaper and various milling machines listing specifications and main features; gives particular attention to recently designed units exhibited at European Machine Tool Exhibition. Misal, Via V. Pisani, 14, Milan, Italy.
L-2-26

Speed Reducers

Five sizes of 3 new designs of worm gear speed reducers presented in illustrated brochure; includes prime features and advantages of these models, plus dimensions and specifications tables and engineering drawings for each. Winsmith, Inc., Springville, (Erie County), N. Y. **L-2-27**

Furnace Controls

Information on Brown instruments and Honeywell controls for industrial furnace and oven equipment contained in 44-page condensed catalog; includes latest developments in field; well illustrated. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa.
L-2-28

Jig Borer

Outstanding advantages and economies of Universal production jig borer No. 2 discussed in leaflet which also describes the work, including jig grinding and milling, which can be done on it. Walter Schroeder, Special Machines Tools, Cassel-W, Germany. **L-2-29**

a tracts of

By M. Kronenberg
Consulting Engineer

Mill Shaving Lead Screws

A new term needs to be coined for describing a machining method discussed by Walter Stender in the November 1954 issue of *Werkstattstechnik und Maschinenbau*. This method is a development of the planetary cutting system which was invented in the United States several decades ago for producing accurate threads.

Accurate lead screws can be made using an "internal milling cutter" rotating about the screw. Chips are similar in shape to milling chips produced in down cutting. They are, however, considerably thinner than usual milling chips, approximating the thickness of shaving chips produced in certain gear cutting methods. In comparison with a turning operation, however, the produced workpiece is multicornered rather than perfectly round. It is claimed that the height of these corners is so small that for all practical purposes no disadvantages ensue.

The tool consists of four cutting edges independently adjustable in a direction central to the center line of the work. The author explains in detail the type of chip formation obtained with this process. He indicates that the bottom of the thread is cut by two cutting edges followed by two other edges which generate the flanks. In this way a thrust in the axial direction of the lead screw is eliminated and the chips do not clog the thread; they can easily be removed by the cutting fluid and do not transfer heat into the work.

Accuracy of the process depends on the rigidity of the machine which must be vibration proof, and on the design of the cutter. The cutter must not be subjected to bending but should work in compression. This is accomplished by the cutting edges working at 15 deg to the tangent of the circumference of rotation. The machine is built with a spring in the tailstock for allowing expansion in the workpiece caused by the cutting temperature. The tailstock center is replaced by a bushing through

which the leadscrew can be run when it is longer than the center distance of the machine.

Errors in accuracy of the pitch are often due to inaccuracy in the master screw, effect of temperatures and of residual stresses in the bar stock. The inaccuracy in the master screw can be reduced so that it has no effect on the screw cut. It is recommended that the machine be placed in a temperature-controlled room to obtain highest cutting accuracy. Tests have proved that a difference of only 3 deg in the temperature of the master screw and of the workpiece results in an error of 0.0004 inch over a length of 12 inches which exceeds the allowable error.

Tool wear is compensated by radial adjustment of the tools at predetermined intervals. The cutting speeds used lie beween 300 and 350 fpm. The cutting time is short as indicated by several examples. The author quotes a case where a screw of about 2-inches diameter and ½-inch pitch with a total length of 10 ft was cut in 45.6 min or a floor-to-floor time of 64.5 min.

Wet-Blasting

Wet-blasting for improving surface finish has been investigated at the Munich Institute of Technology by F. Eisele and G. Dickore, as reported by the latter in an article published in the Nov. 1954 issue of *Werkstattstechnik und Maschinenbau*. Wet-blasting, originally developed in the United States, consists in using a hard powder such as electrocorund or silicon carbide suspended in a liquid for blasting at high velocity onto the surface.

According to diagrams, the highest rate of metal removal was obtained when the angle of impact was about 45 deg to the surface to be wet-blasted. Electrocorund gave the lowest rate of metal removal, namely, 0.0012 cu in per min as against 0.0100 cu in per min with silicon carbides of grain size 80. Silicon carbides of smaller grain sizes resulted in proportionately less metal removal. The author indicates that his tests agree with tests run in Russia by Kastschejew in 1953. Sintered carbide tools, however, should not be wet-blasted with silicon carbides due to the fact that they are not ductile enough. Rather electrocorund should be used. It was also found that a ground surface is more affected by wet-blasting than a planed surface. Best results were obtained when using silicon carbide first and electrocorund later. The author, in one of the tables published with the article, indicates that a surface roughness of about 0.00016 to 0.00020 inch was reduced to a roughness of only 0.000040 inch by wet-blasting with silicon carbide. It

could further be improved to a surface roughness of only 0.000008 inch by a second wet-blasting with electrocorund.

Other tests referred to the wet-blasting of various materials. Depending to a certain extent on the angle of impact, the lowest metal removal occurred with a soft steel, the next higher metal removal was found for lead. Plastic material (Novotext) could be wet-blasted at a high rate, with glass a close second if the angle of impact was changed to 60 deg. The wet-blasting method is also used for improving the surface finish of dies as shown by the illustrations included in the paper.

Tool Angle Standards

New standards for tool angles and grades of carbides have been prepared by the AWF Committee and are published on pages 567 and 568 of the November issue of *Werkstattstechnik und Maschinenbau*. When comparing these data with American practice it should be borne in mind that a positive angle of inclination in our terminology is called negative in Europe. Instead of the concept of side rake and back rake, true rake and clearance angle in a direction approximately perpendicular to the cutting edge are used.

The data include recommendations for numerous types of steels, cast iron, copper, aluminum and plastic materials. Such items as depth of cut and feed rate are classified in five categories.

Organization of Industrial Research

Walter Boesch has published an article on the organization of industrial research in Issue No. 10 of *Industrielle Organisation*, published in Switzerland. The paper includes a historical introduction, and differentiates between the requirements of applied and basic research. Analysis and synopsis of technical development are considered as the basic conditions for organized research rather than leaving the program to accidental discoveries. Using the example of a wrist watch, the author shows how a Swiss manufacturing company came to develop a new type by careful analysis of the basic elements such as functional coordination, energy source, energy storage, motor, regulation of velocity, gear train, means for indication, accuracy, etc. In addition, the author discusses examples from other branches of industry, concluding that over-organization must likewise be avoided, in order to leave sufficient interest in the projects and initiative to the men charged with research in industry.

good reading

ENGINEERING ANALYSIS—AN INTRODUCTION TO PROFESSIONAL METHODS *by D. W. Ver Planck and B. R. Teare, Jr. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $6. 344 pp.*

What must be done to translate engineering situations into mathematical language and the steps to be taken after a mathematical result has been obtained are emphasized in this book. It deals with such matters as defining the problem, and deciding what principle to use, choosing coordinate systems, methods of checking, choosing dimensionless variables and sketching the curves.

In the above steps, the authors convey the entire engineering thought process by showing what the engineer actually writes down as his thoughts develop.

ELEMENTARY TOOL DESIGN *by Elmer B. Benson. Published by Charles A. Bennett Co., Inc., 237 N. Monroe, Peoria 3, Ill. Price $4.76. 224 pp.*

Text material in this book is divided into chapter units which develop progressively. These units begin with the study of the fundamentals needed for understanding and applying the drawing technique and design principles of various types of tools as they are progressively discussed.

Because it is an elementary discussion, technical matter has been avoided; drawings and photographs have been carefully chosen to explain and emphasize the discussion material. The text has been planned for use in a preparatory course in tool designing or tool engineering.

CONDENSED PRACTICAL AIDS FOR THE EXPERIENCED DIE ENGINEER, DIE DESIGNER AND DIE MAKER. *Published by Die Techniques, 350 N. Clark St., Chicago 10, Ill. Price $3.50. 110 pp.*

This pocket-size book gives direct answers to die problems. It contains formulas and tables that the experienced die man encounters every day. Formulas and tables cover the following subjects: bending and forming dies, and blanking and drawing dies.

CREATIVE TIME STUDY AND METHODS. *Published by Society for Advancement of Management, 74 5th Ave., New York 11, N. Y. Price $3.50 to members, $5. to nonmembers. 159 pp.*

Among the subjects discussed in this book are the following: selection of industrial engineering personnel, training of industrial engineering personnel, tomorrow's material handling methods, standard performance time for fork trucks, measurement of maintenance labor, measurement of office operations, predetermined time standards in fabrication and assembly, and automation—advances in automatic production.

CATALOG OF TECHNICAL DATA BOOKS. *Published by Lefax, 9th and Sansome Sts., Philadelphia 7, Pa. No charge. 48 pp.*

This pocket size, loose-leaf book contains price list and a complete data index of Lefax engineering and business data sheets for 1954. It indexes over 2000 subjects, covering all branches of engineering.

METALWORKING LUBRICANTS *by E. L. H. Bastian. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. Price $6.50. 357 pp.*

This manual embodies a store of useful information, advances and developments in the types of metalworking lubricants, as well as the methods and devices for using them in a variety of metalworking processes.

The book covers the kinds and purposes of mold coatings—covers equipment, methods and lubricants employed in both hot and cold forging of metals—shows how to apply drawing fluids and compounds, extrusion lubricants, forging lubricants, rolling oils, etc.

FORMING AND BENDING KAISER ALUMINUM. *Technical editor, Kaiser Aluminum and Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill. Price $2, free on company letterhead. 260 pp.*

This book gives comparative data on various types of forming and bending equipment; characteristics of specific alloys and their suitability to particular operations; comparisons of methods, and technique suggestions to solve specific production problems.

A comparative study of aluminum with some of the ferrous metals is also made for different applications to assist in product design. Photographs, charts, tables and drawings are included to clarify the comparisons of forming and bending methods, machines and tooling.

Who's Meeting - and Where

Feb. 2. Cutting Tool Manufacturers Association. Annual meeting. Detroit Yacht Club, Detroit, Mich. Details are available from association office, 416 Penobscot Bldg., Detroit, Mich.

Feb. 8-9. Illinois Institute of Technology, Armour Research Foundation co-sponsors with Chicago section of the American Welding Society. First annual Midwest welding conference, Institute's Metallurgical and Chemical Engineering Bldg., 10 W. 33rd St., Chicago, to study latest research findings in welding and new welding applications. Direct inquiries to Orville T. Barnett, supervisor of Foundation welding research, Illinois Institute of Technology, Technology Center, 35 W. 33rd St., Chicago 16, Ill.

Feb. 8-10. The Society of the Plastics Industry, Inc. Tenth annual reinforced plastics division conference, Hotel Statler, Los Angeles, Calif. For more details contact society office, 67 W. 44th St., New York 36, N. Y.

Feb. 18-19. National Society of Professional Engineers, annual spring meeting, Hotel Charlotte, Charlotte, N. C. All details are available from society office, 1121 15th St., N. W., Washington 5, D. C.

Feb. 22-23. Society of the Plastics Industry Canada, Inc. Thirteenth annual Canadian conference, Hotel London, London, Ontario, Canada. For more facts, contact society headquarters, 67 W. 44th St., New York 36, N. Y.

Mar. 10-11. Porcelain Enamel Institute. Pacific coast conference, Biltmore Hotel, Los Angeles, Calif. Get details from institute offices, DuPont Circle Bldg., 1346 Connecticut Ave., N. W. Washington, D. C.

Mar. 14-15. Steel Founders' Society of America. Annual meeting, Drake Hotel, Chicago. For details write society headquarters, 920 Midland Bldg., Cleveland 15, Ohio.

Mar. 14-18. American Society of Tool Engineers. 1955 Western Industrial Exposition, Shrine Auditorium and Exposition Hall, Los Angeles. Annual meeting to run concurrently, Am-

bassador [illegible] and Shrine Auditorium. Complete [illegible]ormation available from Society [illegible]quarters, 10700 Puritan Ave., Detr[illegible]38, Mich.

Mar. 15-[illegible] AMERICAN INSTITUTE OF ELECTRICAL [illegible]NGINEERS, Power Division. Utilization [illegible] Aluminum conference, William [illegible] Hotel, Pittsburgh, Pa. Write to institute office, 36 W. 46th St., New York [illegible] N. Y. for more data.

Mar. 16-18. PRESSED METAL INSTITUTE. Annual spring technical meeting, Hotel Carter, Cleveland, Ohio. Request details from institute office, 2860 E. 130th St., Cleveland, Ohio.

Mar. 29-Apr. 7. AMERICAN CHEMICAL SOCIETY. Spring meeting, Cincinnati, Ohio. Details may be had from society offices, 1155 Sixteenth St., N. W., Washington 6, D. C.

Mar. 30-Apr. 1. AMERICAN POWER CONFERENCE, sponsored by Illinois Institute of Technology in cooperation with 14 universities and 9 engineering societies. Will include 30 sessions covering most phases of the power industry. For complete information write to the Institute, 35 W. 33rd St., Technology Center, Chicago 16, Ill.

Apr. 5-7. NATIONAL FLUID POWER ASSOCIATION. Annual spring meeting, Colorado Springs, Colo. Get complete details from association office, 1618 Orrington Ave., Evanston, Ill.

Apr. 6-10. WORLD PLASTICS FAIR AND TRADE EXPOSITION, INC., National Guard Armory, Los Angeles. Get complete information from executive office, 8762 Holloway Dr., Los Angeles 46, Calif.

Apr. 13-15. AMERICAN SOCIETY OF LUBRICATION ENGINEERS. 10th Annual meeting, Hotel Sherman, Chicago, Ill. Address requests for more details to society headquarters, 84 E. Randolph St., Chicago 1, Ill.

Apr. 13-15. SOCIETY OF THE PLASTICS INDUSTRY, INC. Pacific Coast section conference, Palm Springs, Calif. Direct inquiries to society offices, 67 W. 44th St., New York 36, N. Y.

Apr. 16-17. PACKAGING MACHINERY MANUFACTURERS INSTITUTE. Semiannual meeting, Palmer House, Chicago, Ill. For more facts, write institute offices, 342 Madison Ave., New York 17, N. Y.

Apr. 18-20. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Spring meeting, Baltimore, Md. More information may be obtained from society headquarters, 29 W. 39th St., New York 18, N. Y.

May 18-20. PORCELAIN ENAMEL INSTITUTE. Mid-year division conference, Edgewater Beach Hotel, Chicago, Ill. Contact institute headquarters, Dupont Circle Bldg., 1346 Connecticut Ave., N. W., Washington, D. C. for details.

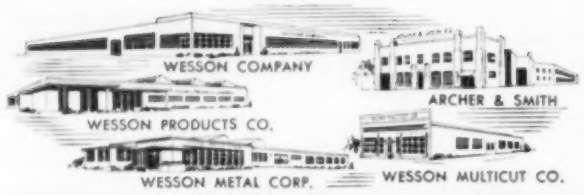
May 31-June 3. BASIC MATERIALS EXPOSITION, Convention Hall, Philadelphia, Pa. For complete information write to managers of the exposition, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

June 8-10. AMERICAN WELDING SOCIETY. Annual welding show, Municipal Auditorium, Kansas City, Mo. Spring technical meeting of the society to run concurrently June 7-10. For details contact society's management office, Suite 1006, 12 E. 41st St., New York, N. Y.

June 20-23. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semi-annual meeting, Statler Hotel, Boston, Mass. For particulars contact society headquarters, 29 W. 39th St., New York, N. Y.

June 20-24. AMERICAN SOCIETY FOR ENGINEERING EDUCATION. 63rd annual meeting, Hetzel Union Bldg., Pennsylvania State College, State College, Pa. Direct inquiries to Prof. K. L. Holderman, General Chairman, 103 Mechanical Engineering Bldg., Pennsylvania State College.

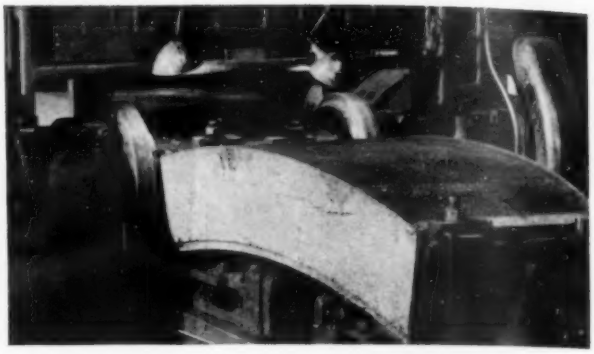
June 26-July 1. AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Chalfonte, Haddon Hall, Atlantic City, N. J. For more information, write society office, 1916 Race St., Philadelphia 3, Pa.



carbide NEWS

Output Jumps On Tough Job

Wessonmetal standard grades outperform all other tool materials tried on huge steel and cast iron tunnel segments



Giant tunnel segments being milled with Wessonmetal carbides. Two segments are milled per setup. Large sand inclusions are evident on side of rough casting.

Typical of new performance records being reported for Wessonmetal carbides is the milling of 7-foot steel and cast iron segments for the new Lincoln tunnel addition using homemade 20-inch catheads.

High speed steel tools could not finish a single segment before burning up due to heavy sand inclusions. Other carbides also broke up or wore excessively. Part of the trouble resulted from the use of 28-year-old duplex millers for the machining operation.

When Wessonmetal grades "M" and "GS" were put on the job, the trouble was licked and 100 to 180 segments were produced per grind. Both Grade M, used on the steel segments, and Grade GS, used on the cast iron segments, have inherently high wear resistance and are designed for heavy shock applications.

Two segments are milled per setup, averaging 35 minutes. Machines are operated at a maximum speed of 110 sfm with a feed of 6 ipm on the steel segments and 14 ipm on cast iron.

Average depth of cut ranges from $\frac{3}{8}$" to $\frac{1}{2}$", although it has often exceeded $\frac{7}{8}$". The catheads are equipped with 15 style BR Wesson lathe tools held in place by two set screws.

Throw-Away Broach Teeth Give Four Carbide Edges, Eliminate Grinding

Elimination of all grinding and fast one-hand indexing to present any of four cutting edges are major advantages of the new-style carbide insert broach tool announced by Wesson Company.

Seat for the carbide insert has a negative angle for maximum edge strength. The locking screw is flush with the top of the clamp, avoiding interference when loosening the lock holding the tool in broach bar.

CARBIDE DATA

Additional information and specifications available:

- ☐ Specification data on new throw-away insert type broach tool design.
- ☐ Wesson Progress Report on boring.

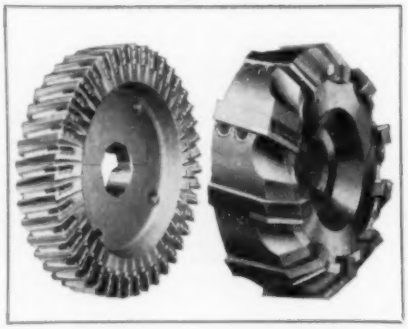
Get data by writing to:
WESSON COMPANY, Dept. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

New Rigidcuts Increase Economy, Milling Range

Two new Rigidcut inserted blade milling cutters, permitting higher feed rates and increased cutting depths are among recent Wesson Company developments.

Feeds of more than 100" per minute on cast iron finishing operations are now possible with the 7200 Series Rigidcut cutter. The new design, using over 4 blades per inch of diameter, eliminates one of the greatest obstacles to practical usage of high feeds on fine finishing operations.

Where a depth of cut up to $\frac{7}{8}$" is needed on cast iron or steel, the new 3100 Series Rigidcut provides the necessary rigidity and strength because of its extra thick body. Special $1\frac{1}{2}$" high Wessonmetal carbide tipped blades are locked in with Wesson Dual-Wedg locks. Rapid and accurate setup is assured by specially designed blade serrations.



Two newest cutters in Rigidcut line. Left to right: Cutter designed for high feed finishing; cutter for heavy duty cast iron and steel machining.

tools Wesson carbide Wessonmetal

Reprint of Advertisement appearing in leading business publications.

Developing an Effective Engineering Organization

technical digests

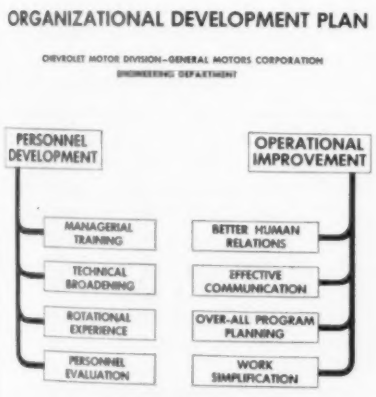
By A. J. Altz

Asst. Chief Engineer—Administration
Chevrolet Div. of G. M.
Detroit, Mich.

THE MOST IMPORTANT FUNCTION of engineering management is to develop engineering people, provide them with the necessary facilities and plan for the most efficient use of both. Personnel development at Chevrolet is accomplished principally by training programs which are designed primarily to recruit and fit new employees for specific engineering jobs and to indoctrinate them in company methods.

Engineering personnel training consists of several heads. The first of these is the G. M. Institute cooperative program. Students are sponsored by the respective divisions and spend alternate periods at the Institute and on the job under divisional assignment.

This cooperative program forces engineering management to project a portion of the personnel requirements four years ahead. It permits scheduling exactly the kind of work experience that will fit the graduate for a specific engineering job. The contacts with the student during his alternate work periods permit more effective guidance of the student in building character and selecting his future field of activity.



College graduate training is a second program. Selected college graduates are given rotative training over a period of two years. They are interviewed by the top engineering executives before their selection. After selection for training, one top executive accepts sponsorship of the graduate and has a voice in formulating the steps in his rotational training program. Generally the graduate spends one to three months on various assignments which are selected on the basis of the graduate's needs to fit him for his projected final assignment.

This phase of the training program forces Engineering Management to look two years ahead to further project the needs for technically educated and trained personnel. In the time that training of college graduates has been in operation, results have been very satisfactory to both participants and management.

Draftsman training program has been in operation for 17 years. It is intended primarily to produce high grade detail draftsmen. Most of the participants are graduates of technical high schools. Toward the end of the program, problems are designed to prove the need for additional education. A large portion of the trainees have enrolled for supplementary education courses.

The training schedule is quite flexible to suit the ability of the participants and needs of the drafting organization. Trainees spend alternate periods in training and in commercial detail drafting. The effectiveness of this training program is proved by the fact that quite a few present design engineers are products of the program.

Mechanics apprentice training is designed to overcome the shortage of high grade engineering mechanics — metal workers, woodworkers, plastics workers, sheet metal workers, assemblers and garage repairmen.

Specification writers convey engineering information, with procedural accuracy, to the people who bring the physical product to the ultimate consumer. Specification writers must be made. Even experienced specification writers from other companies and other lines of business need training in applying the procedures of a specific operation. This training program has proved its worth in developing a strong specifications and records operation.

The stenographic training program is intended to supply engineers with technically competent stenographers. All new stenographic employees and typists with indicated potential are given the benefit of this training program.

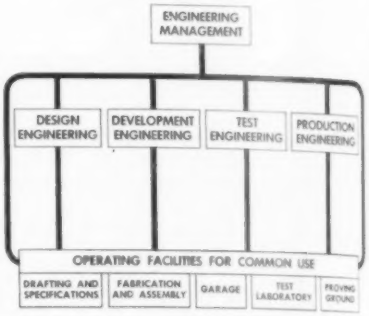
Of equal importance with training is the provision of facilities to make use of engineering personnel to the best advantage. A good man can achieve only fair results with poor facilities. So wise engineering management not only provides for the development of technically trained personnel; but it also provides proper facilities.

Modern equipment stimulates fresh ideas. It is definitely a challenge to the right kind of engineer. So, the second responsibility of engineering management is to provide proper facilities for the use of its trained personnel. Space is of the greatest importance. Restricted space produces restricted ideas; spacious work areas produce broad thinking.

technical digests

After providing all the necessary physical facilities and providing for the development of personnel, the job of engineering management is only well started. There still remains the tremendous task of formulating plans for the efficient use of both the people and the facilities. First, consideration must be given to the functional requirements.

FUNCTIONAL ORGANIZATION PATTERN



Obviously, engineering management heads the operation as shown in the accompanying chart. This includes the Chief Engineer and his assistants, whose duties are mostly executive or administrative in nature. The operating functions of engineering are broadly divided into four categories: Design Engineering, Development Engineering, Test Engineering and Production Engineering. Engineering management provides the necessary operating facilities for the common use of the four branches of engineering. These include drafting and specifications to handle the paper work; fabrication and assembly to provide material for development and test; garage facilities to maintain and rebuild vehicles; test laboratory facilities to provide factual data on components; and the proving ground facilities to test complete vehicles under various conditions of actual operation. This is the functional pattern. The responsibility pattern on the organization chart looks quite different.

The people of engineering, like the musicians, are expected to know the

basic techniques of their profession. But they need training to perform according to the desires of their leader. Both the musicians and the engineers need individual development so they can contribute most effectively to harmonious, cooperative effort. To produce a masterful performance, either in engineering or in the symphony orchestra, requires a lot of planning, rehearsing and effective direction. It takes the full cooperation of everyone concerned.

From a presentation given at the 1954 Management Conference of the Cleveland Engineering Society.

▼ ▼ ▼

Improving Machine Tools

By W. W. Gilbert
Consultant, Machinability
General Electric Co.
Schenectady, N. Y.

AUTOMATION, in the broad concept, is raising the level of manufacturing operations by providing better tools and methods. Although the fully automatic factory for manufacturing operations is a long way off, automation provides a means of progressive upgrading operations for making, inspecting, assembling, testing and packaging of products.

Material handling equipment must be integrated with machine tools in the automation area. Many existing machines may be automated today by the addition of transfer equipment. Others may be purchased with transfer mechanisms or are designed for the addition of such equipment.

This is the broad concept of increasing efficiency by automation, but effort must be concentrated also on reducing manufacturing costs when using individual machine tools in job shop areas. Machine operating costs are:

1. Actual machine cutting costs
2. Tool changing costs
3. Nonproductive costs.

Actual machine cutting costs may be reduced by taking full advantage of metal-cutting principles and good planning. Rates of metal-cutting can be increased many times by increasing feeds, using multiple tools of the best design and machining free-cutting materials. Most modern machines have sufficient power for average commercial conditions but are not rigid enough to take heavy cuts at high speeds without vibration. Reducing vibration will allow more effective use of harder grades of carbide.

Use of prelocated tools and quick-changing toolholders reduces tool-changing time and makes feasible operating at higher cutting speeds and changing tools more often. Changing tools is a major problem that deserves much further study and attention.

Designs should be incorporated into standard machine tools to make the cutting tools available. Turret lathe manufacturers have taken good advantage of turrets on both the cross slide and the tail turret to hold tools accurately and rigidly in position so that they are available during a sequence of operations. Rapid indexing of the turrets by power is needed on some of the larger machine tools to reduce operator fatigue. Standardized spindle mountings should be used wherever possible so that interchangeable arbors, chucks, and toolholders may be used on a variety of similar machines.

Loading of material into the machine tool becomes more of a problem as the size of parts increases and as manufacturing operations are upgraded. It is desirable for the machine tool manufacturer to supply as standard items, work-holding devices which will have sufficient rigidity to take full advantage of the capabilities of the machine tool. Lifting and positioning devices could be incorporated even in the low-production equipment, since in most cases power should be supplied to help

the operator to lift and clamp the work easily.

NMTB codes and the JIC codes have set standards which, if followed, will eliminate most servicing difficulties associated with complicated hydraulic and electrical control systems. Electrical motors and controls should always be located so that they are easily accessible for maintenance and replacement.

Vibrations are encountered when machining extremely large castings or forgings which limit the use of carbide tools and reduce the machining speed and the size of cut.

In the manufacture of small aircraft components, such as used in instruments, there is a need for small high-precision machine tools. These machines approach the jeweler's lathe in size and must be able to work to extremely close tolerances with reasonably high production.

Chipless production methods are becoming more important, particularly in the fields where it is necessary to fabricate high-cost materials.

Better methods are needed for forming thin sheet metal for aircraft. It is desirable to have machines designed not only to stamp and draw thin metals but also to transport them from one operation to the next, to prevent damage and accelerate production.

Chip disposal systems should be designed so that automatic conveyors will transport the chips from the machine.

With the aggressive cooperation of the buyer, the machine tool builder and the machine tool distributor, it will be possible to make metter products at a reasonable price and to give our people a higher standard of living. This will require constant development of machines and methods.

From a paper "What Users Expect from the Machine Tool Industry," given at 1954 Machine Tool Distributors' Meeting, Cincinnati, O.

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Wax Coolants and Heat Dispersion

by F. C. Kraatz

Technical Service Mgr.

S. C. Johnson & Son, Inc.

Racine, Wis.

In the three years of production history with wax lubricants, a broad base of experience has developed which is so promising as to warrant more than just a passing examination.

A typical report comes from a ma-

chine company in Auburn, New York. On a hill planetary thread mill machining 155 mm projectiles, a wax coolant increased cutter life from 70 to 150 pieces per grind. Total tool life of each cutter was increased from 400 to 1100 pieces.

In broaching cast iron and cast steel sprockets at a Minneapolis implement company, the number of pieces per cutter was increased from 3500 to 5000 for cast iron and from 4000 to 7000 for cast steel, *Fig.* 1.

Case histories like these present performance records in excess of what is

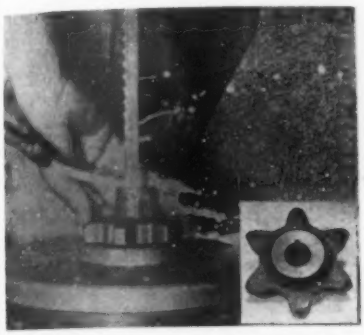

Fig. 1. Broaching cast steel sprockets. Pieces per cutter increased from 4000 to 7000 by change to wax coolant.

generally considered to be within the scope of cutting fluids. In order to reconcile this phenomenal performance, a knowledge of both waxes and metalworking processes is a prerequisite. The basic facts about wax, briefly stated, are these: First, wax is not a product; it is a raw material. It is merely an ingredient from which products can be made. No single wax is in itself able to do what a finished product will do, but from the hundreds of waxes available, it is possible to blend a wax base which will have a combination of excellent properties not available from any other source. Such a wax base is a "fluid film" lubricant as differentiated from an "extreme pressure" or "film strength" lubricant. It supplies fluid film lubrication at pressures as high as 200,000 psi. It does this not only for a moment in the laboratory, but in actual production. In addition, this wax base provides such lubrication at temperatures in excess of 450 F.

Another important property of this blend is that it exhibits polarity of a higher order. That is, it strongly exercises a polar attraction for metal, not mere adhesiveness but rather an attraction which makes it seek out and attach itself to metal.

Cooling theories for wax coolants, so new in the field, are many and varied. However, in addition to case histories,

there is available substantial evidence to prove that wax coolants have remarkable heat dispersing properties. For example, in single point turning tests, representative of shop operations, data concerning tool life and other factors were obtained.

The cooling power of wax coolant is shown in a single point turning demonstration, *Fig.* 2, comparing a wax type

Fig. 2. Turning temperature tests set up on a 16-inch engine lathe. Multiple valve arrangement in coolant line permits quick transfer from one coolant to another. Temperature drop of 200 F was indicated by a chip color change in switch from standard soluble oil type coolant to a wax coolant.

material with a standard soluble oil coolant. As a change is made from one coolant to the other, an immediate color change occurs in the chip, a white chip with wax and a blue chip with the other coolant, clear evidence of a reduction in temperature of 200 F. Regardless of the explanation, the results are obvious.

From a paper given before the 1954 annual meeting of the ASLE.

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How to Use Polyester Plastics

by D. Wilson
Vice President
Polyrein Corp.

Polyester reinforced plastics are used as a replacement for window glass in critical areas, in skylights, partitions, bathtub enclosures, draft deflectors, awnings, signs, truck bodies and storefront material, etc. In addition, custom molded articles, such as compressor housings, air line galley units, tanks for chemicals, paper process machine parts, luggage, aircraft parts, car bodies, boats, furniture, lamp globes, pipes and fittings, industrial sinks, snowshoes, and many others may be listed.

A polyester reinforced laminate is not in itself a simple structure. It uses

a wide variety of materials, in order to provide the maximum in structural strength, smart appearance and high utility value. Some of these materials are roving or continuous glass fiber, chopped strand, glass mat, polyester resin, catalyst, promoter, fillers, pigments, foam panels for refrigeration purposes, honeycomb sections for lightness in weight and high structural strength, cellophane and many others could be mentioned.

Production Methods

Depending on the end product desired, various manufacturing methods are employed. Among those most commonly used are the continuous impregnation techniques illustrated by corrugated and flat sheets, the contact method which consists of using either a male or female mold and applying a hand layup to the mold, permitting the resin to curve at room temperature, with no pressure applied. An example of this method is shown in a chair seat.

In many cases it is desirable to use pressure to eliminate voids. This technique is used with a female mold, where a hand layup is made and a bag roughly formed to the shape of the finished article is placed inside the mold, a cover is placed over the bag and a pressure of approximately 8 to 10 pounds per square inch is applied.

Another method is the vacuum bag technique, where the reverse of the pressure bag method is applicable.

Wherever the volume is sufficiently great to justify higher tool costs, the use of matched metal or matched reinforced polyester molds is recommended. The metal molds which have been used with success have been made from aluminum, Kirksite or magnesium.

Two other methods are also gaining in popularity, namely the prepreg and preform. Although these techniques differ insofar as the impregnation of the mat is concerned, they were designed to do a similar job. In the prepreg method, the glass reinforcing material is impregnated with a catalyzed resin and permitted to set until it becomes tacky. Following this, it may be removed from the pattern and kept in storage at room temperatures for up to six months before molding. In the preform method, a fine screen to the shape of the desired object from an internal dimension standpoint, is sprayed with chopped glass fibers and resin, on a slowly rotating platform. Following cure, this preformed shape of fibers and resin binder is stripped

from the screen. In the molding operation, the preform is added to the mold dry, and the liquid resin is added by a separate operation, prior to closing the mold. As a result of this technique, the part produced requires little finishing, and this type of operation has been found to be the most economical in polyester reinforced laminates.

One reason for the almost fabulous growth of this material is the fact that it combines the more desirable advantages of many known materials in one product. Some of these are: it is lighter than aluminum, yet stronger than steel by many times, on a pound for pound basis; it is highly resistant to shock, both thermal and physical; it has extremely good chemical resistance properties; it lends itself to flexibility in design; a major advantage is its low mold and tooling cost; it is highly resistant to extremes of heat and cold; and last but far from least, it can with minimum effort be made into highly attractive articles.

From a paper presented at the 1954 Canadian SPI annual conference.

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Flashwelding High-Strength Alloy Steels

by W. G. Fassnacht

Bendix Aviation Corp.

Flashwelding high-strength steels, such as are used in aircraft landing gear, is a very critical process which must be closely controlled in order to prevent defects, especially "penetrators." A cause for this defect is postulated and the means for controlling it described.

The author's company has developed curves and charts to facilitate the establishment of proper cycles for welding various sized material. These are explained, as are the methods available for determining whether a satisfactory weld has been made on test welds as well as in production. Production of a quality weld does not stop with making one with adequate strength. Also involved are dimensional tolerances and facilitation of subsequent manufacturing operations. The effect of tooling and other details of the welding process on these factors are also discussed.

From a paper given before the 1954 fall meeting of the American Welding Society, Chicago.

How to Choose Gasketing for Hydraulics

by **H. C. Crosland**

Tech. Dir., Sirvene Div.
Chicago Rawhide Mfg. Co.

What type of packing or gasketing material should be used with a certain hydraulic fluid? The best service at lowest cost is obtained by supplying the expert with all facts surrounding the individual packing problem.

Halogenated hydrocarbons—such as the RPM fluids are hard on synthetic rubber packings. A low swell Buna N compound would be the best recommendation when temperature ranges from 0 F to 250 F. Application should be checked because of possible volume increases of 30 to 40 percent with this type of fluid. Teflon or Kel-F, correctly designed, can be used with this and any of the other fluids. None appear to affect these two materials, and limitations of their use are physical limitations rather than effect of fluids.

Phosphate esters include Skydrol or Pydraul. Seals and packings made from butyl rubber or silicone are entirely satisfactory. Tests run as high as 212 F indicate only nominal volume increase and durometer decrease with these two, properly compounded. Seals recommended for hydrocarbon base fluids are unusable if a switch is made to nonflammable phosphate esters.

Water glycol types include Hydrolube and Houghtosafe. Depending on the type of seal required and the temperature range involved, Buna N, neoprene, silicone and butyl all are satisfactory with this class of fluids, which was one of the first to reach widespread use. These fluids give little trouble on all types of sealing applications in hydraulic systems, although different brands affect synthetic rubber compounds differently. At 212 F a volume change of 1 to 25 percent can be found depending on make of fluid and type of synthetic rubber.

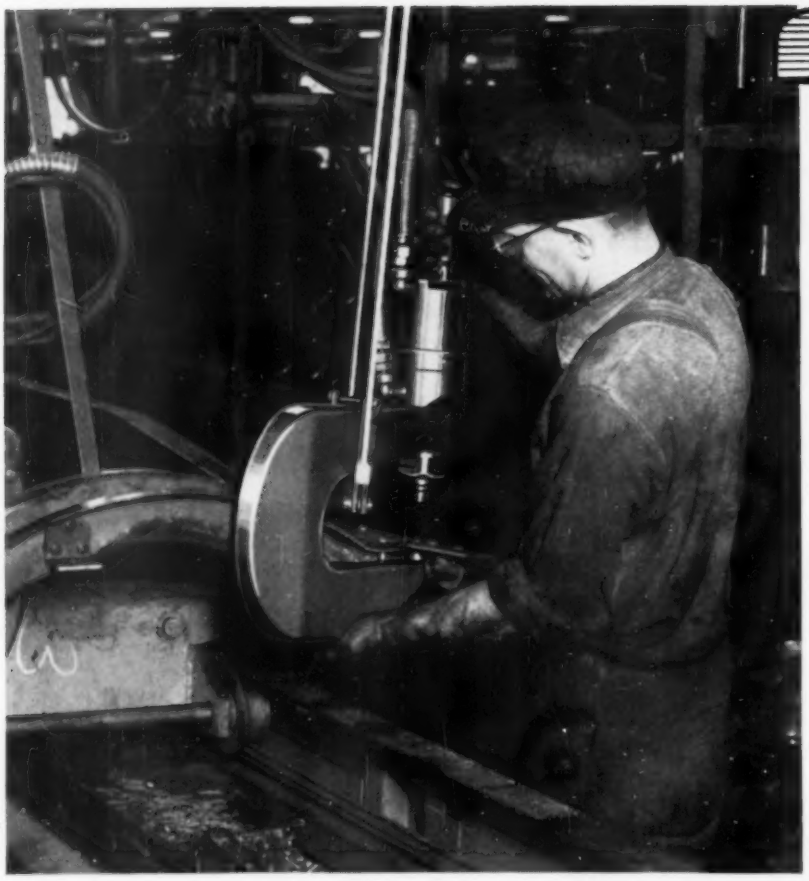
Silicone fluids are good because of their excellent viscosity index. Sealing these fluids is more a design problem than a compounding one. Most synthetic rubbers will shrink when in contact with silicone fluids. The Buna N materials, low in acrylonitrile content, have a very low shrinkage when in contact with these fluids and appear to lend themselves best to this work. Also helpful are the silicone fluids having viscosities in excess of 100 centipoise because they have less effect on the rubber than those with low viscosities.

Tricresyl phosphate is known also as Lindol HF. Special care must be taken in selecting packing and gasket stocks. Normal applications are adequately taken care of by butyl rubber base synthetic rubbers. Silicone base compounds have been used with great success in some cases. But softening or tenderizing can be expected on both compounds above 212 F.

Carbonated diphenyls—of which type Arochlor 1248 is typical. At regular temperatures, Buna N, GR-S butyl rubber, or silicone base compounds are satisfactory. But the field narrows to silicone base compounds as temperatures are increased. Careful selection of the compound to the application is stressed again here.

Soluble oils—produced by various oil companies. None of these present a particular problem to the rubber compounder. The correct compound can be supplied for each application. Buna N's, neoprenes, and silicones can be used and can be properly sealed through a temperature range of −65 F to 350 F with the organic polymers. The temperature range can be enlarged with use of Teflon and Kel-F.

From a paper given at the 1954 Nat'l. Conference on Industrial Hydraulics, Chicago.



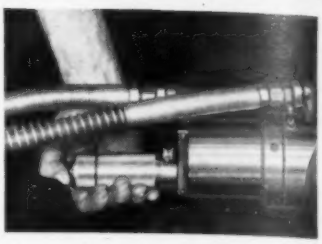
ACTION PICTURE
of how to save money by riveting!

This action photo, taken on the frame assembly line in one of the largest auto factories, illustrates how cost-conscious manufacturers save money with Hannifin "Hy-Power" Hydraulic Riveters.

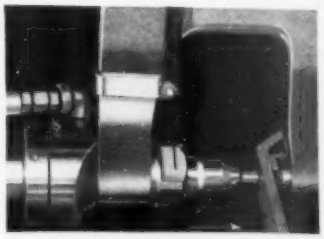
First step in assembly is to rivet the frame together...with Hannifin "Hy-Power" Riveters. The light-weight forged C-Frames hang from balancers within easy reach of each operator. No special skill is required to head the ⅜" rivets, cold, each in seconds. What's more, this "silent squeeze" method forms stronger, more uniform rivets, hot or cold.

Power source is the Hannifin "Hy-Power" Hydraulic Pressure Generator which quietly supplies pressure to the "Hy-Power" Cylinder that does the work. These riveters are available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities.

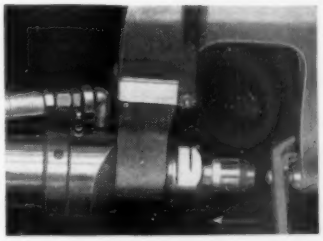
here's the HANNIFIN "HY-POWER" WORK CYCLE



In position. A single control button starts (or interrupts) the automatic Hy-Power cycle.



Ram approaches fast, then hydraulic pressure automatically intensifies, and the rivet head is formed.



Fast, automatic return. Total elapsed time to head a rivet is only 2 to 3 seconds.

"HY-POWER" CAN ALSO BE USED IN MULTIPLE TO SET SEVERAL RIVETS

Bulletin 150 tells how to save money on riveting, staking, punching, forming and bending operations. Write for copy.

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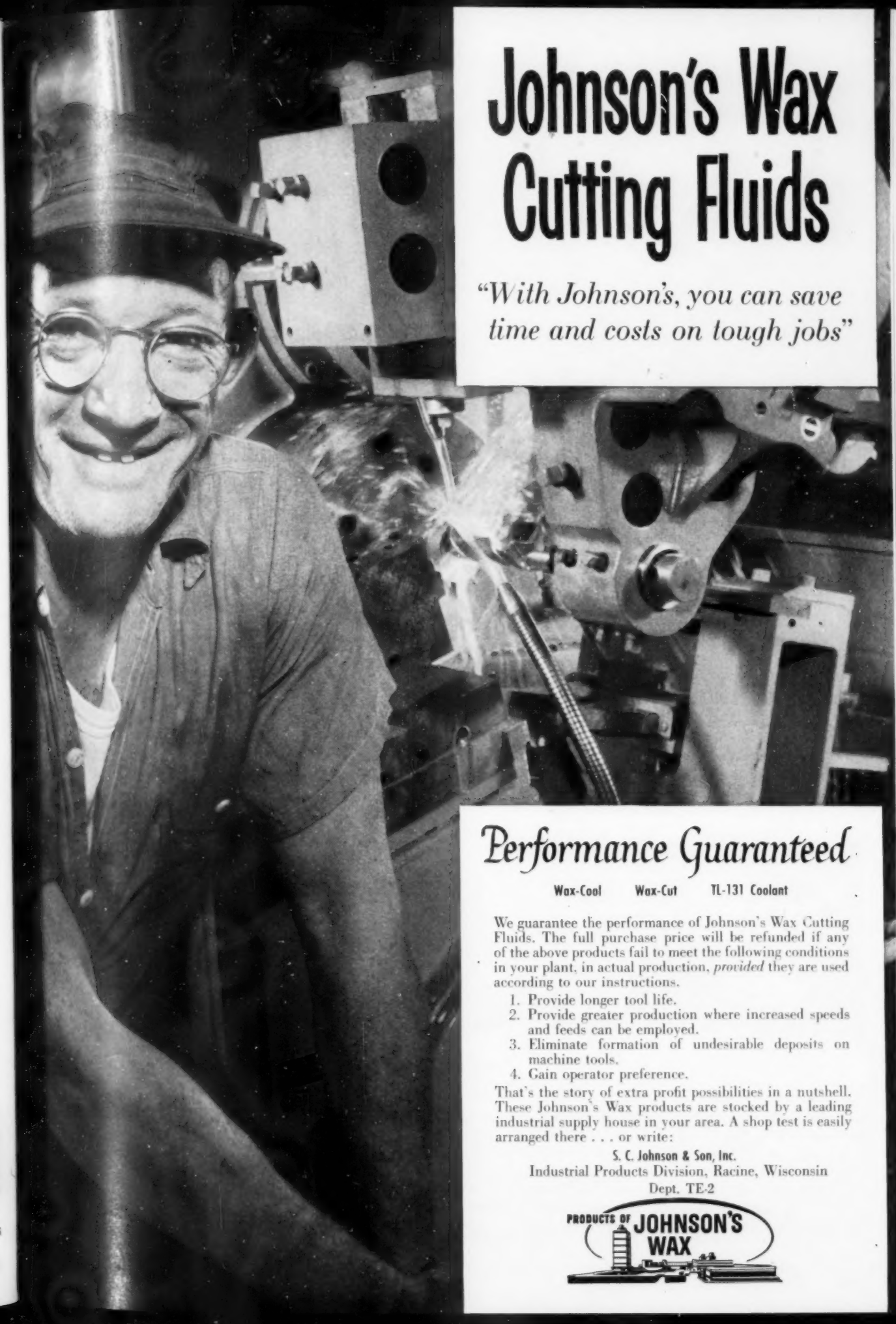

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That's the story of extra profit possibilities in a nutshell. These Johnson's Wax products are stocked by a leading industrial supply house in your area. A shop test is easily arranged there . . . or write:

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a new and different tool holder

of rugged design, simple to use,

positive locking and

universal application

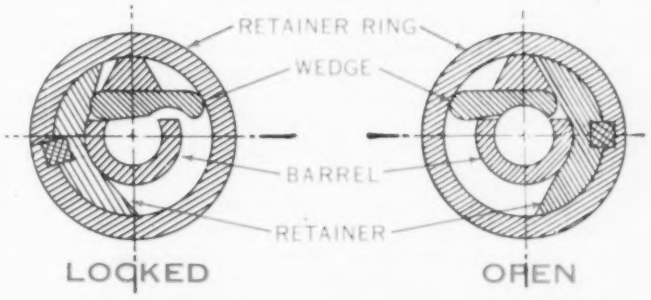
A simple hand spinning of the Wej-Lok retainer ring locks or unlocks inserted tools. Yet, either left or right-hand cutting tools are firmly held by this accurately machined tool holder.

In locked position, the flat surface of holder wedge is tightly seated in mating notched section of tool shank. Normal operating torque tends to further tighten this wedging action, thus, preventing all possibility of tool play or wobble. Where unusually large tools or extra heavy cutting operations are required, provision is made on the holder for use of a Baker drive to augment wedge locking and assure utmost stability.

Wej-Lok tool holder permits universal usage . . . grinding a simple flat area on any tool shank to match holder wedge provides positive locking. You will find Wej-Lok superior in every respect on all drilling, reaming, boring and milling operations.

Note these unusual Wej-Lok features:

1. Shank and barrel machined from one piece.
2. Accurately machined to exacting tolerances.
3. Finest quality hardened steel used in all parts.
4. Long-life through elimination of wear areas.
5. Positive wedge type locking of tools.
6. Wedge lock plus Baker drive on larger tools.
7. Simple insertion and removal of tools.
8. Can be used for right or left-hand cutting tools.
9. All tools quickly ground for use in holder.
10. Designed for standard straight shank end mills.



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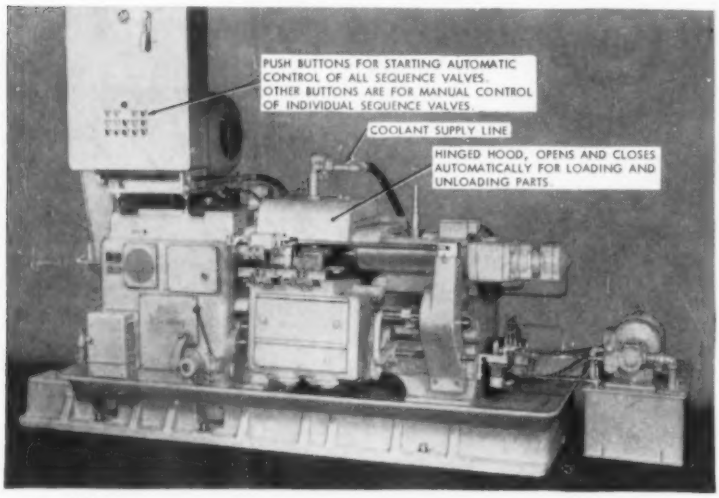
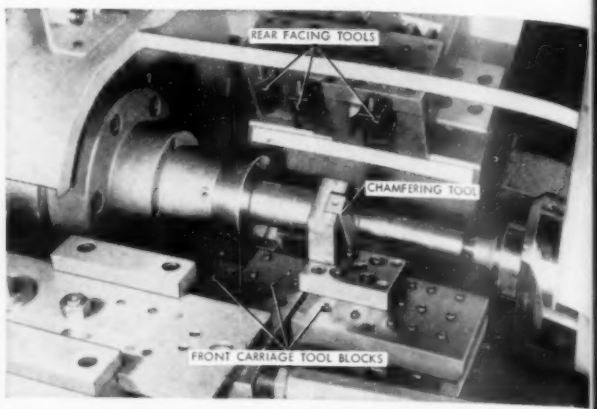
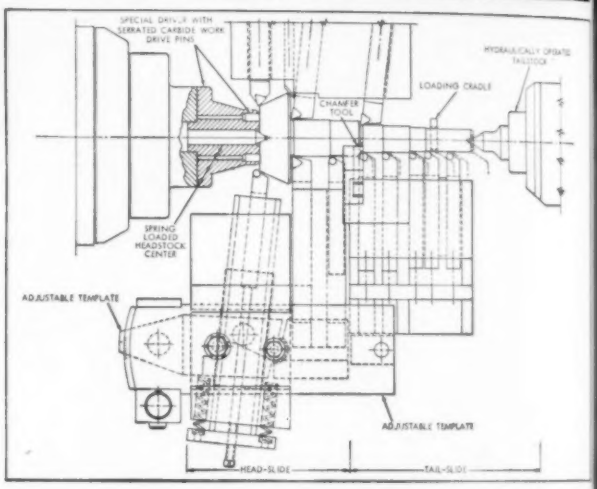
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Hinged hood in open position for loading and unloading parts ▶







Lo-swing LATHE CUTS MACHINING AND HANDLING TIME ON REAR AXLE DRIVE PINIONS

PROBLEM: To finish turn (from end to end) Rear Axle Drive Pinions in one operation and to reduce handling time to a strict minimum.

SOLUTION: A Model AR Automatic Lo-swing Lathe, equipped with Automatic Controls and Serrated Pin Type Driver was selected for this job. The work piece is driven from the gear end by a special driver fitted with serrated carbide pins which indent the large face of the gear. Indentation is obtained by pressure from the tailstock center which is mounted in a hydraulically operated quill. Two pressures, automatically controlled, are used...a high pressure for forming the indent while the shaft is being loaded between centers and a low pressure during the actual machining operation.

This method of driving the work piece permits the machining of all of the gear and stem diameters as well as the facing and undercutting of shoulders in a single operation. Eight carbide front turning tools, one of which is template operated, reduces the length of cut to 2-3/16". This is the length of cut required for the bearing nearest to the bevel gear. The facing, undercutting and chamfering of shoulders are accomplished with four carbide tools mounted on the rear slide. It should be noted that the template is adjustable to handle bevel gears having different angles.

Handling time and operator fatigue are held to a strict minimum by the use of a loading cradle and automatic controls for placing the part between centers, and opening and closing the hinged hood.

The machine stops at the end of the cycle with the spindle stopped, tailstock center retracted, hinged hood open and with the machined part dropped into the cradle. The operator simply replaces the finished part with a rough forging and then pushes two starting buttons, energizing the loader controls, which consecutively close the hood, place the work between centers, indent for the driver pins and finally start spindle rotation. The automatic cycle from then on is controlled by the automatic camming built into the base machine.

The tooling area of the machine is entirely enclosed to protect the operator from flying chips and coolant while cutting at high spindle speeds. Two starting buttons, wired in series, require the operator to use both hands. They are so located that the operator is out of range of the closing hood, thereby preventing accidents.

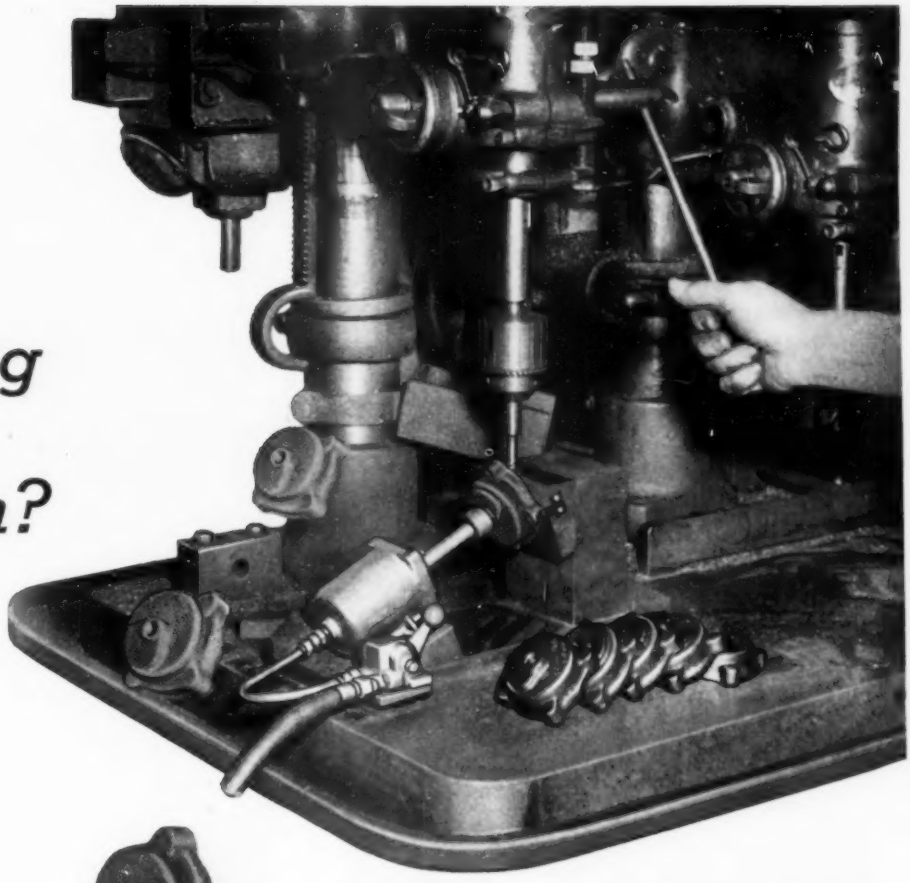
Control buttons on the door of the starter panel permit normal operation of individual controls and are convenient for setting up and timing loader movements.

Seneca Falls engineering staff is at your disposal to help solve your production problems.

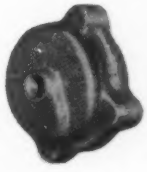
SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

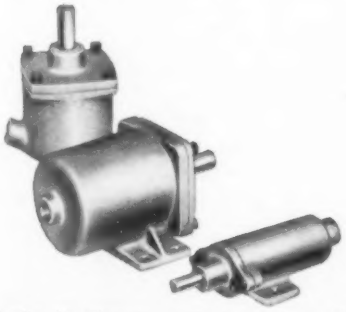
PRODUCTION COSTS ARE LOWER WITH Lo-swing

Clamping Problem?



SCHRADER has the answer!





Schrader Air Clamping Cylinders are available either base or leg mounted, in 1", 2¼" and 3" diameters delivering a 2" or 1" stroke. A wide selection of Schrader Valves is available to operate this equipment.

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Company _____

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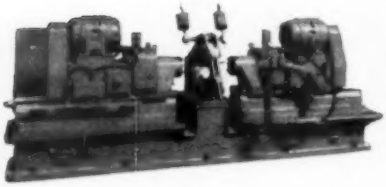
10 solutions

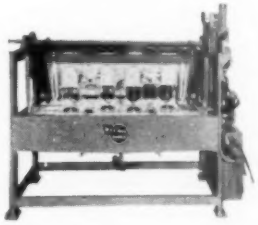
TO DIVERSE PRODUCTION PROBLEMS WITH W. F. & JOHN BARNES SPECIAL MACHINES AND EQUIPMENT

The 10 examples shown here are typical of the broad range of special machinery and allied equipment that are today designed and built at W. F. & John Barnes. All have been especially engineered to meet a specific production problem. Each represents a profitable solution to the problem of saving time and cutting costs. Collectively, these machines present tangible evidence of the coordinated skills and versatility of machine building experience available to you at Barnes.



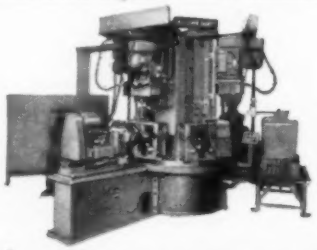
1 TWO-WAY HORIZONTAL BORING MACHINE — rough bores and chamfers automobile transmission cases at 82.5 pieces per hour (80%). This unit completes 18 operations.

2 BARNES SPECIAL MACHINE — drills and counter-sinks Tractor Spindle Extensions. Performs ten operations with pieces completed at the rate of 19.5 per hour (80%). Center head has 4-spindle cluster arranged for pivoting to provide adjustable spindle pattern.

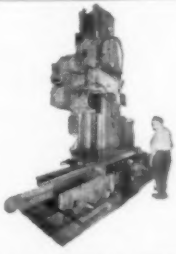


3 SPECIAL SEMI-AUTOMATIC TESTING MACHINE — developed to test for leaks in automotive power steering castings. Four castings are inspected with each machine cycle. Workpieces are loaded and unloaded manually . . . all other operations are performed automatically.

4 AUTOMATIC RETORT LOADING MACHINE — one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers, and special conveyors, designed and built by Barnes for the food, chemical, and beverage industries.



5 BARNES 6-STATION CENTER COLUMN MACHINE — with 72" diameter indexing table, completes 18 operations per piece, 118 pieces per hour, on Cast Aluminum Transmission Extension Housings in a large automotive plant.

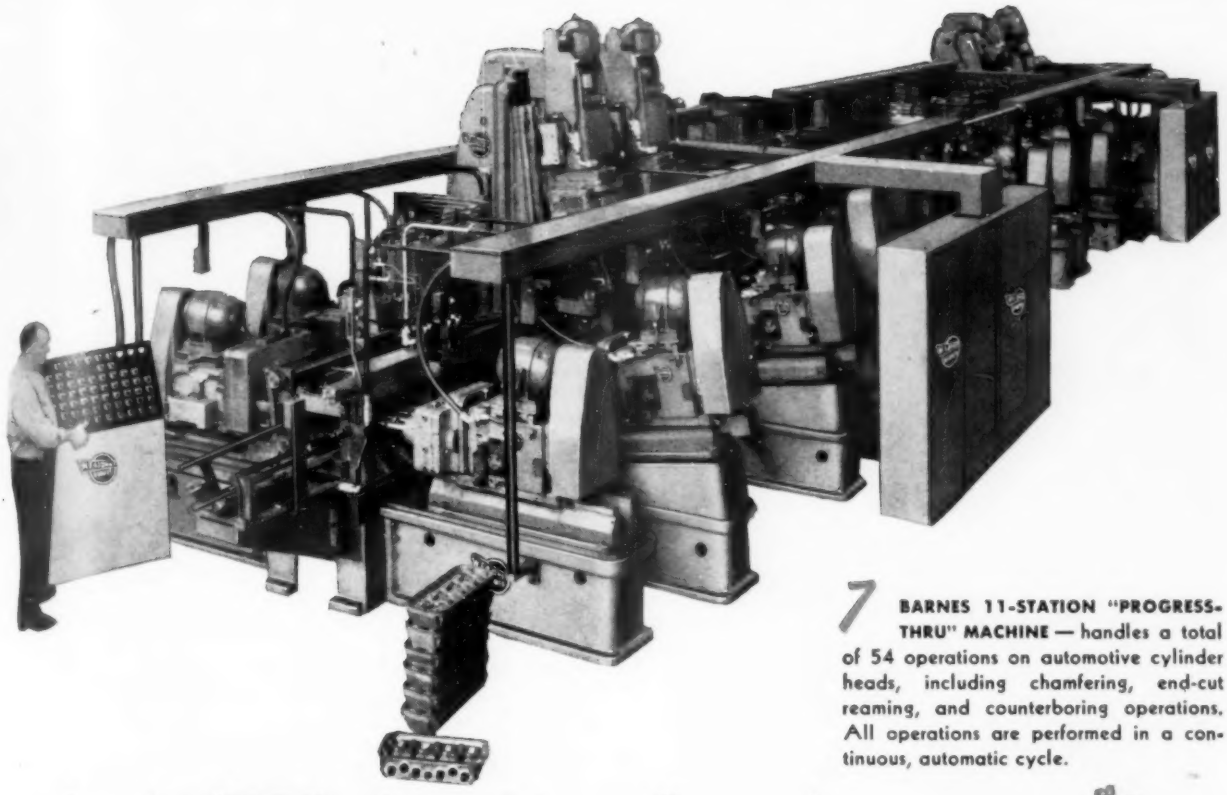


6 SPECIAL VERTICAL SINGLE-SPINDLE MILLING MACHINE — with 72" saddle, slab and face mills mounting pads on a variety of motor frames. Quick setup features enable 6½ pieces to be completed per hour.

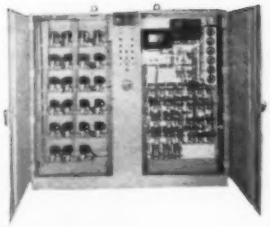
W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1879

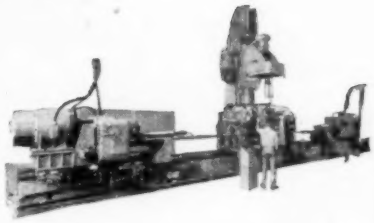
MULTIPLE SPINDLE DRILLING • BORING • TAPPING



7 **BARNES 11-STATION "PROGRESS-THRU" MACHINE** — handles a total of 54 operations on automotive cylinder heads, including chamfering, end-cut reaming, and counterboring operations. All operations are performed in a continuous, automatic cycle.



8 **ELECTRICAL CONTROL PANEL** — automatically controls regeneration and service operations on two sets of deionizing tanks, alternating units for a constant supply of treated water . . . one of countless applications where Barnes Electrical Controls add efficiency and economy to everyday industrial operations.



9 **SPECIAL TWO-WAY VERTICAL AND HORIZONTAL BORING MACHINE** — rough, semi-finish, and finish-bores, chamfers, and faces Final Drive Housings. Spindles automatically change speeds and feeds to meet boring and facing requirements.

10 **APRON-TYPE CONVEYOR** — especially designed for efficient removal of chips from machines used in a large automotive plant. Barnes Conveyors have been designed and built for a wide variety of applications.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES...

SPECIALIZED MANUFACTURING FACILITIES — 75-year background, large well equipped plant efficiently tooled to produce high production machines.

SPECIAL HYDRAULIC EQUIPMENT — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

SPECIAL ELECTRICAL EQUIPMENT and CONTROLS — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.

SPECIAL GAUGES, FIXTURES, TOOLS — designed for each individual machining problem, assure accuracy of operations at high production speeds.

SPECIAL HANDLING AND CONVEYOR EQUIPMENT — designed and built to reduce work handling, effect maximum safety and efficiency.

COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Teamwork solves complex problems quickly.

Write **FOR FREE DATA**

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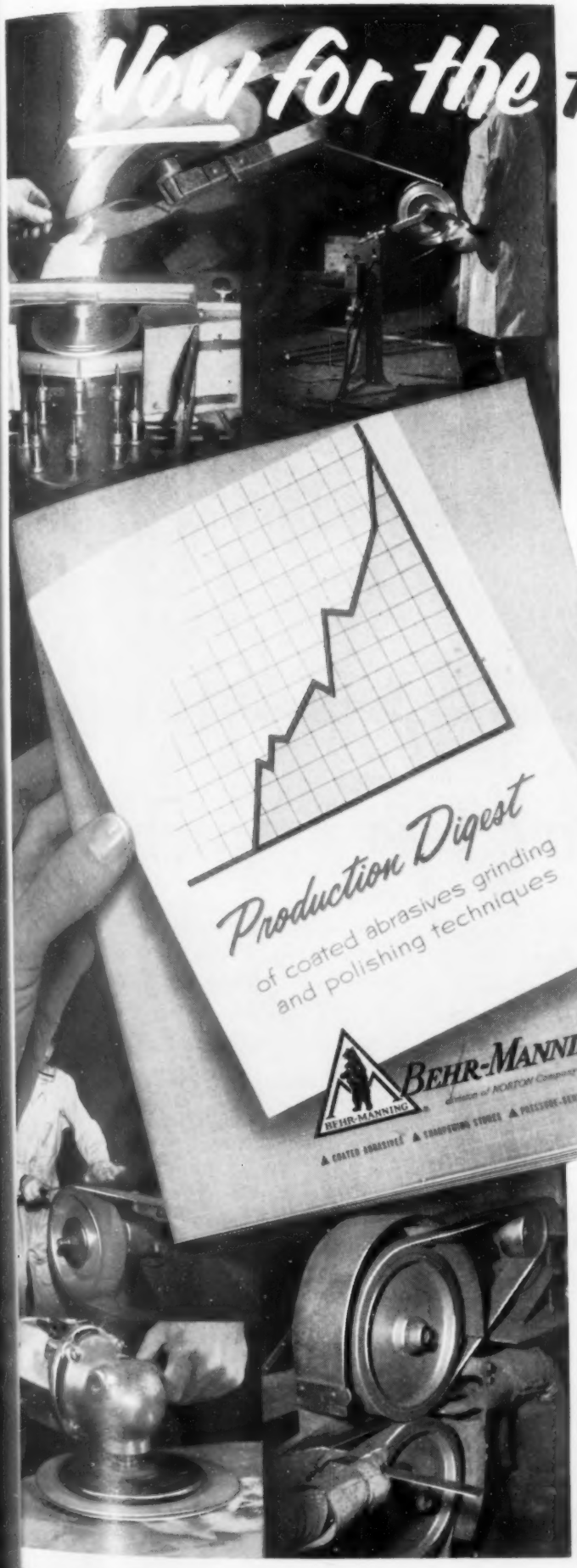
W. F. & JOHN BARNES COMPANY • 405 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



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This comprehensive manual, written by BEHR-MANNING Methods Engineers, is the first known effort of its kind in the field today. It contains detailed information which will help you solve grinding and polishing problems as well as suggest new and practical application methods.

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- Lubricants Aid Abrasive Belt Grinding and Polishing
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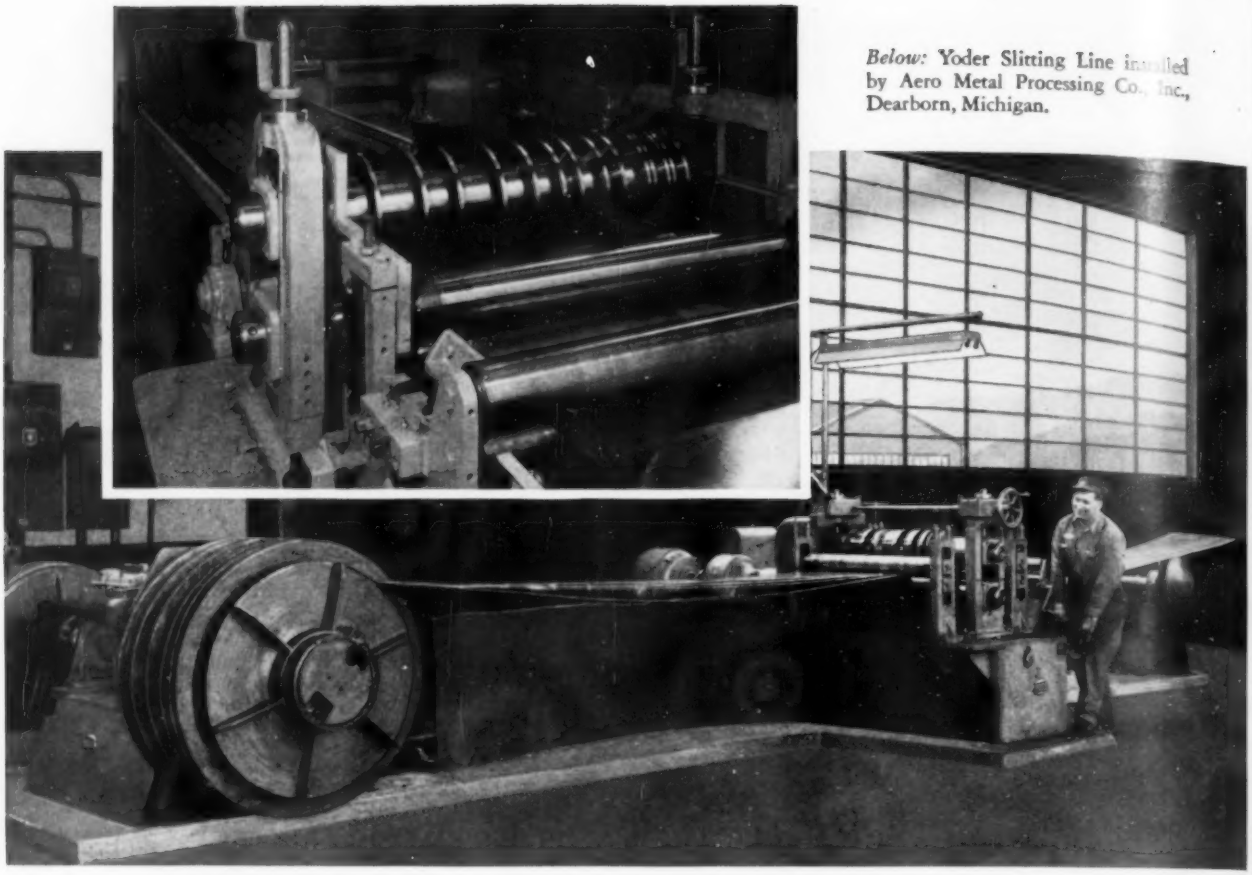

Below: Yoder Slitting Line installed by Aero Metal Processing Co., Inc., Dearborn, Michigan.

When is a Slitting Line Profitable?

● Many variables are to be considered in determining where and when a slitting line becomes a good investment. Also of what size, type, speed it should be, and other special features required to make it most profitable under any given set of conditions. Without obligation, a Yoder representative will call upon request and discuss such details with you.

The Yoder Slitter Book deals extensively with basic considerations in the choice and operation of slitting lines; points out, for instance, how and where a relatively small, inexpensive installation may be more economical than a larger, faster, and costlier one. (Yoder makes all types). Time studies show how coil size, strip gauge, slitter speed, coil handling and banding time affect cycle time and cost per ton.

The book is useful not only to present operators of slitting lines but to producers, users and distributors of strip and sheet metal who may be considering installing slitting equipment. A copy is yours for the asking.

THE YODER COMPANY
5525 Walworth Ave. • Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding

ENGINEERING YODER MANUFACTURING

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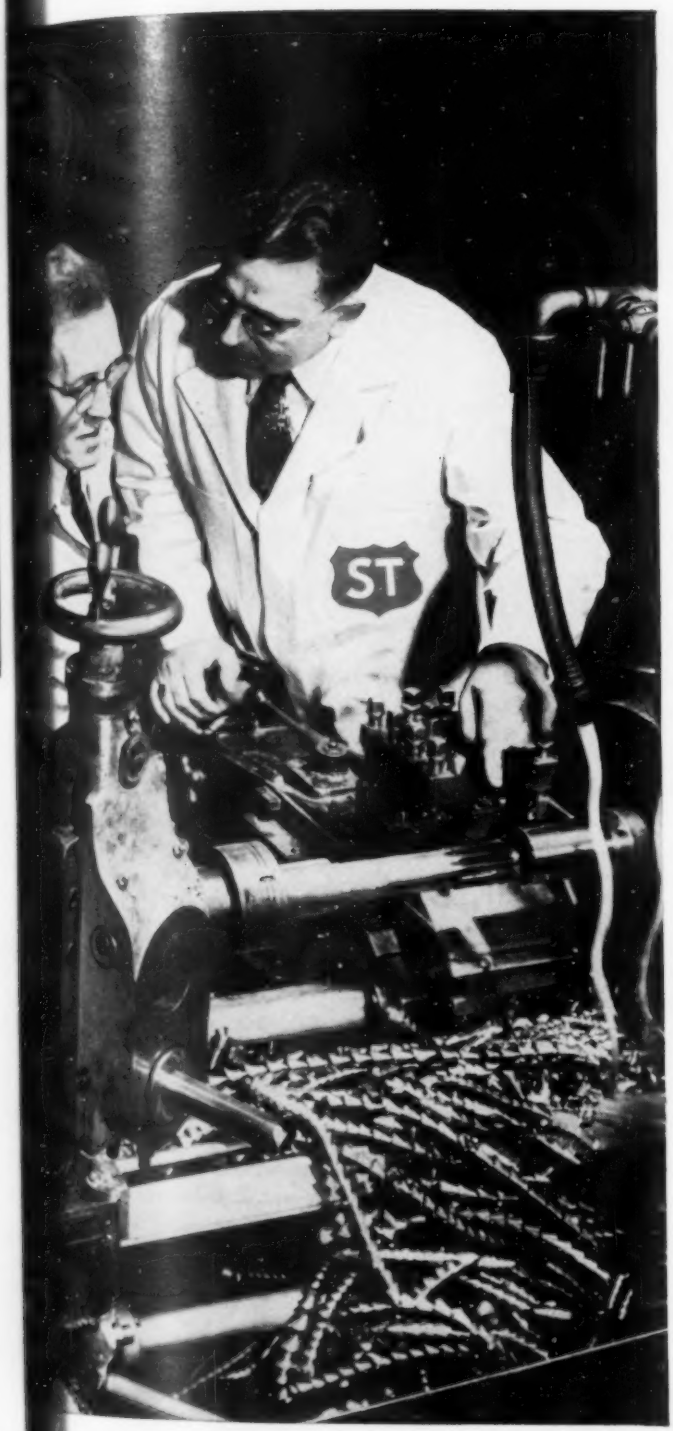

● The Standard Tool Man, Serving Industry Since 1881, can show you how to improve finish, increase tool life and cut production costs. He has broad experience on many types of metal cutting. Find out how his tooling knowledge can help cut your costs. The Standard Tool Man is at your service without obligation.

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THE STANDARD LINE *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

Only GRAPH-MO® gives you all three advantages in one tool steel

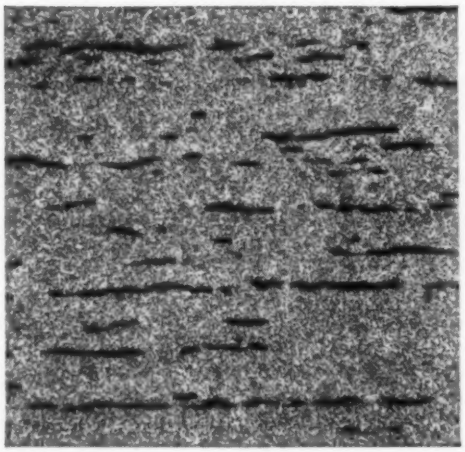
Wearability—*Outwears other tool steels 3 to 1*

Stability—*Is the most stable gage steel ever made*

Machinability—*Cuts machining time 30%*

YOU can make gages and dies that stay accurate longer and produce them in less time by using Graph-Mo® graphitic tool steel. That's because only Graph-Mo gives you the combination of wearability, stability and machinability that you want in a tool steel.

Free graphite and diamond-hard carbides in the structure of Graph-Mo steel give gages and dies extraordinary life. Reports from users show that Graph-Mo outwears other tool steels 3 to 1.



100X

In your plant, Graph-Mo steel will cut production time and rejects. Because of its graphitic structure, Graph-Mo steel machines 30% faster than other tool steels. This structure also gives excellent resistance to abrasion, and has minimum tendency to pick up, scuff or gall. Tests on Amsler Wear Machine show Graph-Mo has twice the resistance to galling when compared with ordinary tool steels.

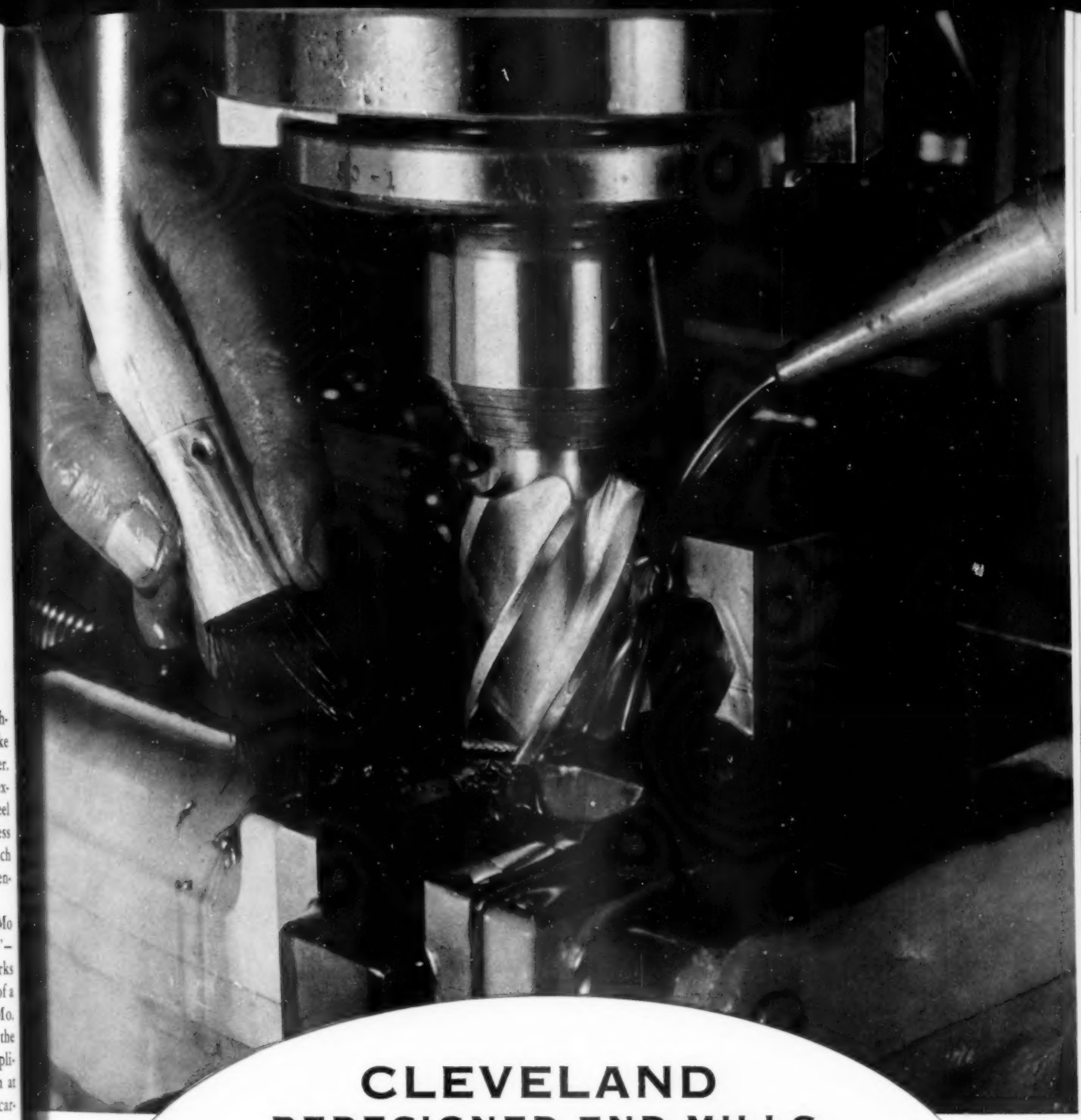
The greater stability of Graph-Mo steel enables you to make gages that stay accurate longer. After 12 years of service, for example, a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original dimensions.

You can always tell Graph-Mo steel by its "graphitic look"—the tiny, scattered, parallel marks barely visible on the surface of a piece of polished Graph-Mo. This built-in "trade-mark", the result of free graphite in its structure, can't be duplicated in ordinary steels. The photomicrograph at left shows the free graphite and diamond-hard carbides that give Graph-Mo unusual wear resistance.

Write today for more information on Graph-Mo steel. The Timken Roller Bearing Company, Steel and Tube Div., Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



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REDESIGNED END MILLS

Cut faster • Clear chips better
Greater accuracy • Stronger • More durable

Engineered to give you maximum cutting qualities at greatly increased rates of feed, with a minimum amount of wear.

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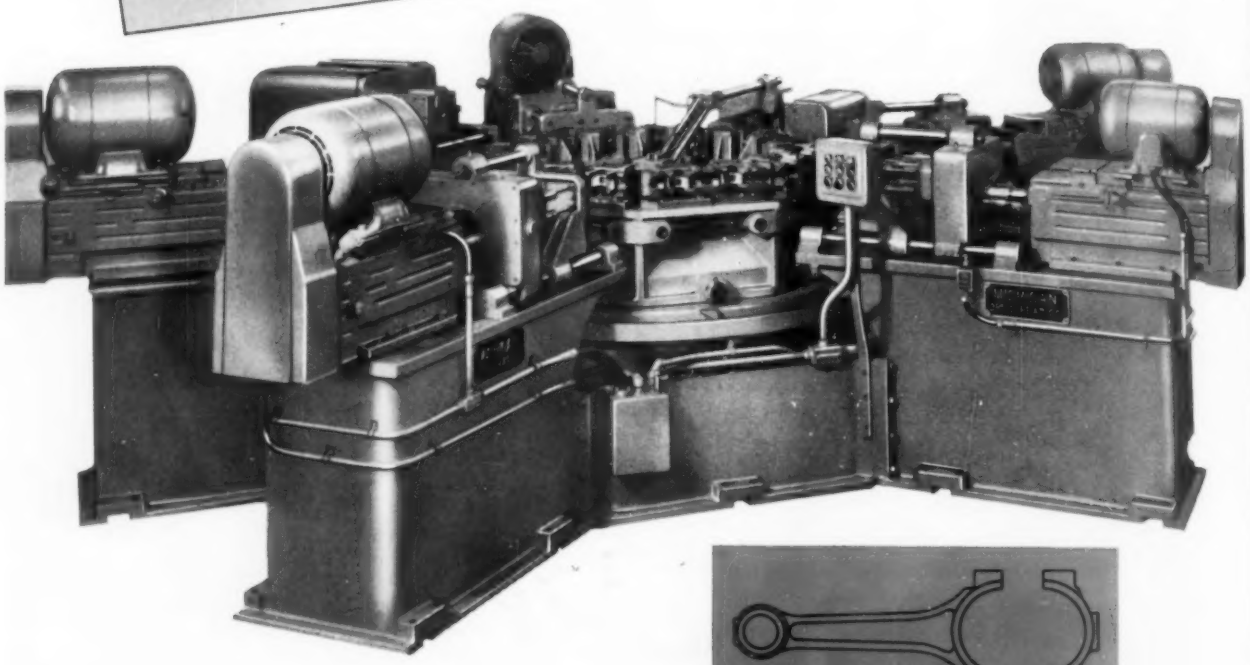

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For Faster, More Economical Production

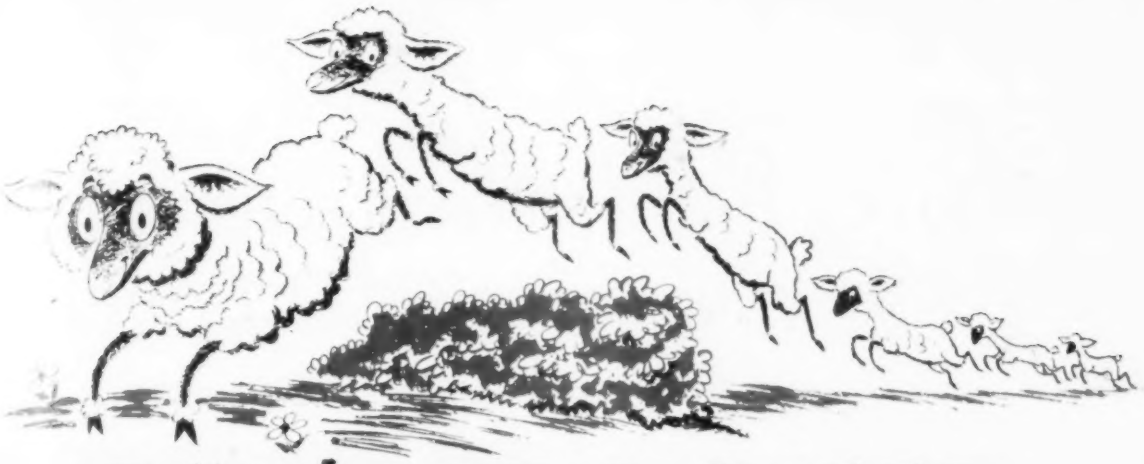
Drills — Semi-finish Reams — Mills Notch Ring — Mills Oil Groove — and Finish Reams Bolt Holes in connecting Rod and Cap assemblies

PRODUCES 500 ASSEMBLIES PER HOUR WITH ONE OPERATOR

We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic.

Michigan DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment



DON'T BE A SHEEP WHEN BUYING GAGES!

You can go far astray following a "FAD"

It's fashionable today to buy costly, complicated gages for even simple gaging requirements. Sure, we like to sell expensive gages, but we don't think it's good business to sell such gages when simple gages will do. Perhaps an Indicator Gage does require a little operator care but it's still the most economical when a few instructions are given on its proper care and use. And after all, its accuracy is entirely adequate for most applications.

Consider a few of the advantages of using Indicator Gages where these will perform the job: Each gage is a complete package — there are no extra appurtenances to buy and maintain. No wires and hoses to drag and tangle. No accessories to lose, no airlines to keep clean. It is simple to operate, simple to maintain. Its purchase price is low, as is also its maintenance cost. In addition, the greater range per unit, and its greater flexibility, permit an Indicator Gage to perform far more operations than an excessively accurate and complicated gage so fashionable right now.

Ask for our complete catalog.

Federal Products Corporation
5192 Eddy Street, Providence 1, R. I.

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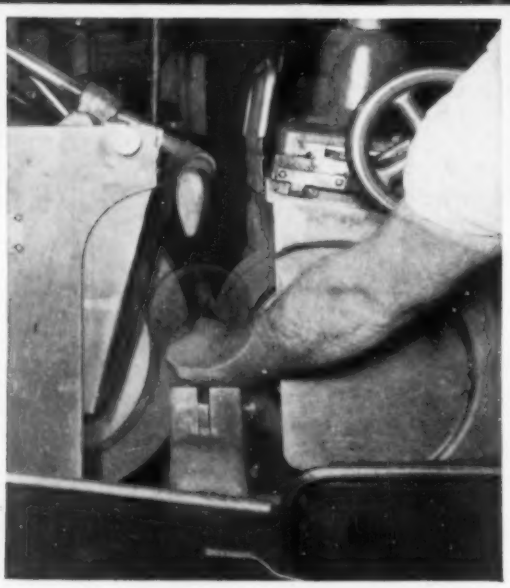
FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

On-the-job photos . . . on-the-job facts . . . show

Norton G Bond wheels setting new economy records in O. D. grinding



"***Production rate increased*** *35%* by G Bond wheels, with a greatly improved finish," are two typical "Touch of Gold" advantages reported by the user performing this cylindrical grinding operation. Job calls for .025" stock removal from 1040 seamless steel tubing, with ⅛" wall. The machine is a Norton — a reminder that only Norton offers you such long experience in both grinding machines and wheels, to help you produce more at lower cost.

"***We now get 800 pieces per dress*** with Norton G Bond wheels, as against 500 pieces with previous wheels. Also, we get 50% more wheel life, a better finish, and the shoulder holds up much better." Those are the facts reported on this plunge-cut centerless grinding job. Work is a ¾" diameter x 1" long stud from which .012" stock is removed, to .0005" tolerance and 20 microinch finish.

Users tell how "TOUCH of GOLD" performance boosts production rate, product quality and profits

In many years, nothing has done as much to raise the standards of precision and semi-precision grinding as Norton G Bond wheels. In the field of O.D. grinding, for example, users all over the country report that these greatly advanced wheels have given them an entirely new slant on the profit-possibilities of their centerless and cylindrical grinding jobs.

Here we can illustrate and quote only a bare minimum of the very many enthusiastic endorsements that are pouring in. But you could sum them all up in this sentence: "G Bond wheels grind faster, finish better, last longer and save us money on every job."

The reason is, the Norton G Bond is by far the most efficient vitrified bond ever developed. Wheels made with it outperform all others of this type, with "Touch of Gold" advantages like these:

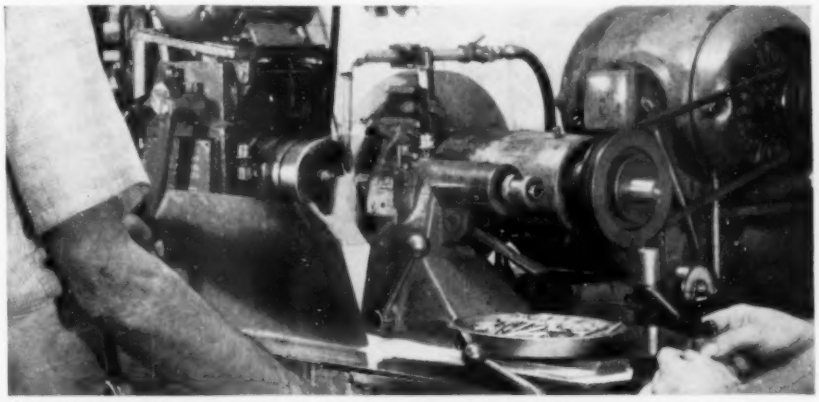
Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on crushing roll.

See your Norton distributor

for proof of how G Bond wheels can help improve your products and cut your production costs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products... to make your products better

"***G Bond wheels last up to 40% longer,***" reports this centerless grinding customer. The piece is a vanadium alloy steel spindle ¼" diameter x 10" long, with a tapered shank — ground in a plunge cut which removes an average of .045". With G Bond they found that wheel life increased 30% to 40% because this greatly improved vitrified bond breaks down evenly.



"***100% better finish***" is just one of the advantages listed by this user who switched to G Bond wheels for cylindrical grinding of small diameter stock. And besides improvement in product quality, this firm reports 50% more pieces per dress, with the last piece ground before dressing showing every bit as good a finish as the first piece ground after dress — additional G Bond benefits adding up to "Touch of Gold" performance.

W-1606

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

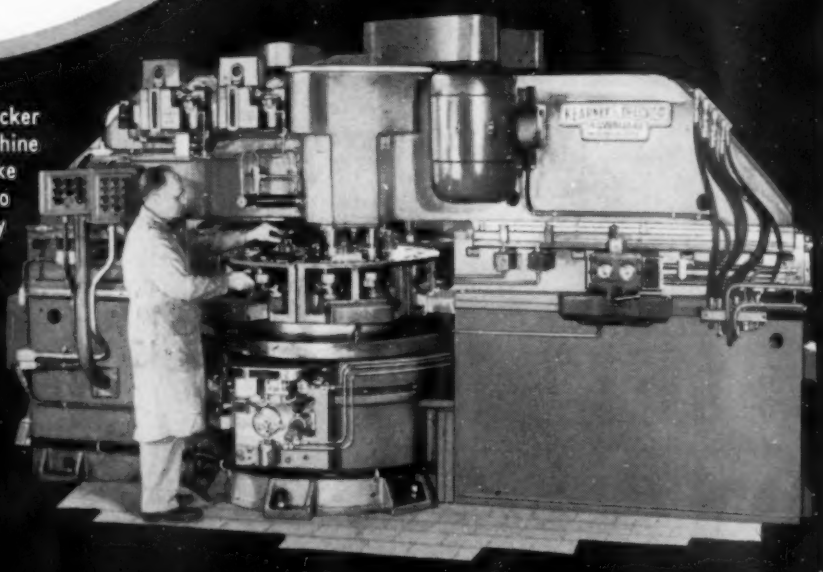
CUSTOMER SPECIFIED

An automotive manufacturer recently asked Kearney & Trecker to design and build a special machine which would increase production milling of three pads and three pockets on transmission rear brake drums.

Machine completes all three pads and pockets on transmission rear brake drum.

KEARNEY & TRECKER DESIGNED

Here is our design. It's a Kearney & Trecker six-station rotary indexing milling machine which mills 162 transmission rear brake drums per hour. It does the work of two machines, each of which could mill only one workpiece at one time. With the new unit, six pieces are milled at once. A prominent feature of this machine was the application of standard Kearney & Trecker units . . . a 48" rotary index table and a 24" feed slide. This type of design appreciably decreases the overall cost of the machine. All six spindles are contained in one head which is bridged over the table. Retractable quills raise and lower the spindles.



New production efficiency starts with Kearney & Trecker Milwaukee machine tools

This typical example proves you can reduce costs and start on the road to higher production with machines designed and built by Kearney & Trecker's Special Machinery Division. With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has all the ingenuity and skill required to solve special machining and production problems.

Why don't you take advantage of our abilities? They can pay off in profits for you. Your Kearney & Trecker Special Machinery Division representative will be pleased to give you all details. Call him today!

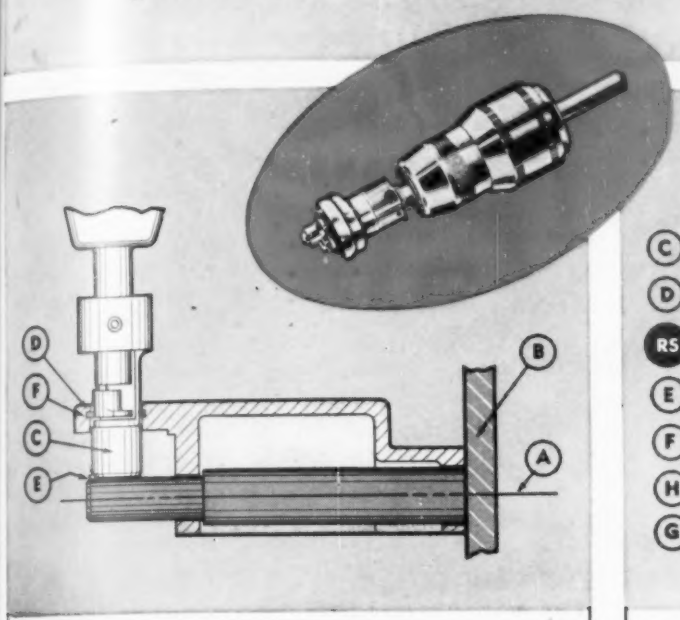
For more details on the machine illustrated ask for Data Sheet No. 1044. The free booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

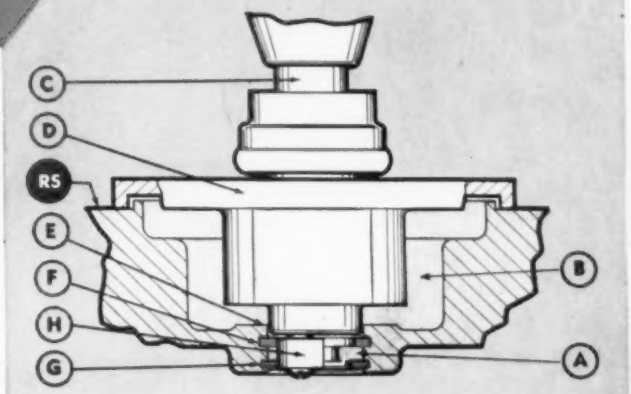
Waldes Truarc grooving tool solves tough internal grooving problems, cuts costs in assembly-line production



Problem: **Locating a Groove From Centerline of a Hole A.**

(a) Workpiece is fitted into plug on fixture plate **B**.

(b) Bottom adaptor **C** on standard Waldes Truarc Grooving Tool is piloted into bore **D** and registers on side of plug **E**. Groove **F** is cut in exact location required.



Problem: **Cutting Two Grooves—One Rectangular, One Beveled—Located In Bore *A* In Large Cavity *B* of Workpiece, and Located From Reference Surface *RS*.**

(a) Waldes Truarc Grooving Tool is fitted with elongated spindle assembly **C** and special bushing **D** which spans large cavity permitting tool to register on reference surface ***RS***. Bushing also pilots tool into counter-bore at ***E***.

(b) Both grooves **F** and **G** are cut simultaneously with special form cutter ***H*** having both required contours.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.00 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEMS TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

WRITE *NOW* FOR 20-PAGE MANUAL CONTAINING FULL INFORMATION ON WALDES TRUARC GROOVING TOOL ▶

WALDES

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GROOVING TOOL

MADE BY THE MANUFACTURERS OF
WALDES TRUARC RETAINING RINGS.
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.

WALDES TRUARC GROOVING TOOL MANUFACTURED UNDER U. S. PAT. 2,411,424

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

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TE-027 ★

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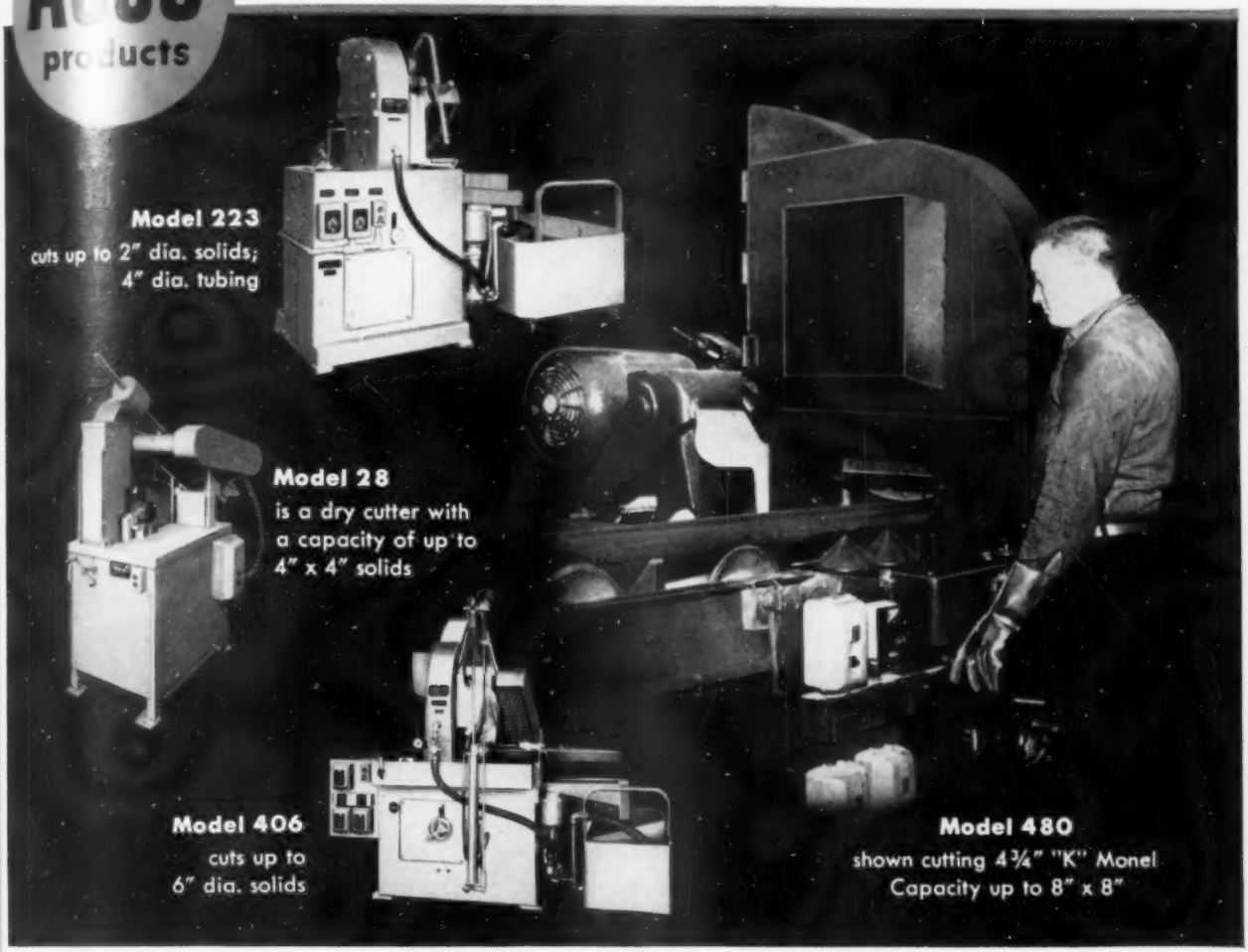
Campbell Abrasive Cutters



Cuts alloy and high carbon steel quicker, smoother and more economically

• Faster cutting of alloy and high carbon steel stock by CAMPBELL Abrasive Cutters—much faster than by other methods—reduces your labor costs and the number of machines required.

But that's only a start on the savings that the CAMPBELL abrasive cutting method makes possible. Large savings of materials result from the close tolerances, smooth finish and straight cuts with CAMPBELL cutters. Finishing time and costs are reduced as these machines cut all kinds of stock without surface hardening and with smooth finish.

CAMPBELL offers you the widest range of plus-services—

Superior sales engineering services—CAMPBELL experts are fully experienced in every type of cutting problem. They will help you select the machine best fitted to your requirement. They are available for consultation on cutting problems at any time.

Economy and speed of operation—CAMPBELL Abrasive Cutters handle every type of cutting job with accuracy, efficiency and economy. The big MODEL 480, for instance, cuts 4¾" diameter "K" Monel in two minutes per cut. The small MODEL 28 takes approximately 3 seconds per square inch of material.

Complete line of standard machines—It pays to select from a complete line. Only then are you sure that the abrasive cutter you buy is the one most profitable for your job. CAMPBELL Abrasive Cutters have many exclusive features. They are available as fully or semi-automatic equipment.

Consultation with trained CAMPBELL engineers will cost you nothing. It may show how to increase output per man hour.

Write for Bulletin DH-301 on "The Principles of Abrasive Cutting"

ACCO

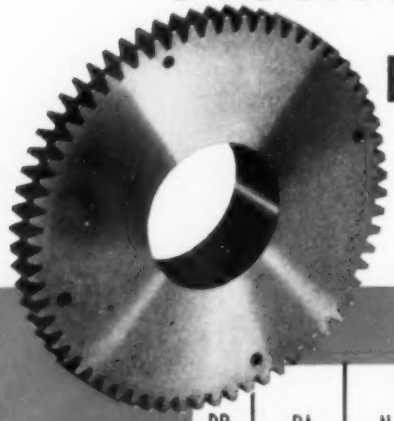
Campbell Machine Division
AMERICAN CHAIN & CABLE
945 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

Barber-Colman

Precision Hobbing Machines

PROVIDE ACCURACY CONTROL



GEAR DATA CHART

GEAR DATA					MACHINE CONDITIONS		INSPECTION RESULTS		COMPARISON TO
DP	PA	N	D	Helix Angle	Hob Speed (RPM)	Feed ("/rev.)	Total Composite Error	Tooth-to-Tooth Composite Error	Agma Accuracy Classification
48	20°	192	4.000	0°	157	.005	.00025	.00005	Class 3 Prec.
48	14½°	128	2.672	3°39'LH	230	.010	.0003	.00015	Class 2 Prec.
64	20°	176	2.750	0°	309	.016	.00035	.0001	Class 1 Prec.
96	20°	64	.667	0°	309	.010	.0002	.0001	Class 2 Prec.
96	20°	16	.167	0°	133	.006	.0003	.0001	Class 2 Prec.
120	20°	21	.175	0°	133	.006	0003	.0001	Class 2 Prec.
32	20°	64	2.000	0°	183	.006	.0010	.0004	Class 1 Prec.

This precision gear manufacturer hobs gears in all of the precision classes shown in ASA B6.11-51, "Inspection of Fine-Pitch Gears". While the quantity of gears cut per production order is usually quite small, the methods used indicate the important elements which must be controlled in any precision gear cutting operation.

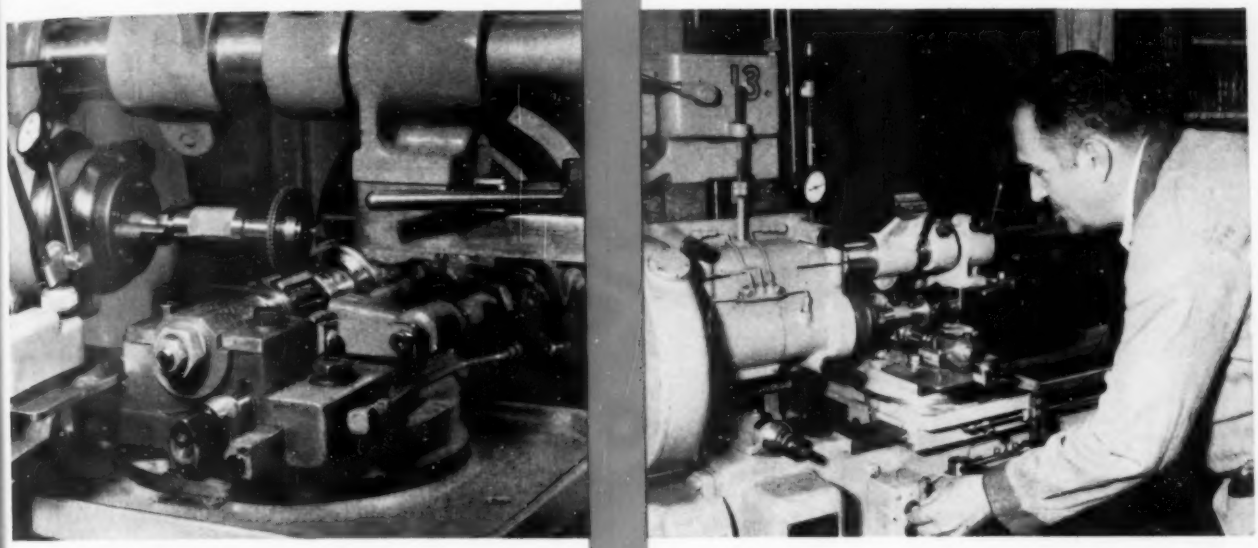
To obtain the finest accuracy, this plant uses Barber-Colman Precision No. 6-10 Hobbing Machines, in combination with Class AA ultra precision hobs. Precision Class 2 tolerances are held, and these results on fine pitches are generally considered the best obtainable. Only Class AA hobs are used for gears of this accuracy because any inaccuracies occurring in the hob will produce gear tooth profile errors which in turn contribute to tooth-to-tooth and total composite errors. These ultra precision hobs are maintained at peak accuracy by periodic precision sharpening on Barber-Colman sharpening machines, removing .005" stock or less, depending on pitch. Hobs are inspected after each sharpening to standard tolerances for Class AA hobs.

Prior to hobbing, all blanks are machined to precision tolerances. For all precision gears, squareness of the face with the bore, accuracy of the bore, and lateral runout

BUILDERS OF PRECISION GEAR

Precision Class AA Hobs

NEEDED FOR PRECISION FINE PITCH GEARS



should be held to the standard tolerances for that particular class of gear. The blank must run true within these tolerances when it is mounted on the hobbing machine. For the utmost accuracy, gears are hobbed between centers. Prior to mounting the work, the line-up of the centers is checked with a test bar. Finished gears are rolled with a master gear or rack.

Using this general procedure for each precision gear, this plant produces gears of finest accuracy, as indicated in the table.

Although the degree of accuracy may vary in some applications, these methods and controls indicate some of the important elements which must be controlled.

If you require precision gears of the finest accuracy, you can meet the rigid specs with Barber-Colman hobs and equipment. For specific hob applications, write our engineers or call your Barber-Colman representative for full details.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

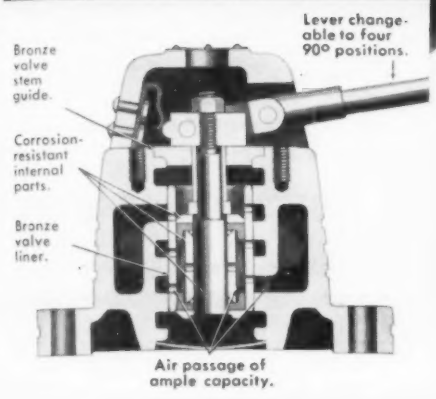
GENERAL OFFICES AND PLANT, 632 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

AIR POWER CAN BE COSTLY!

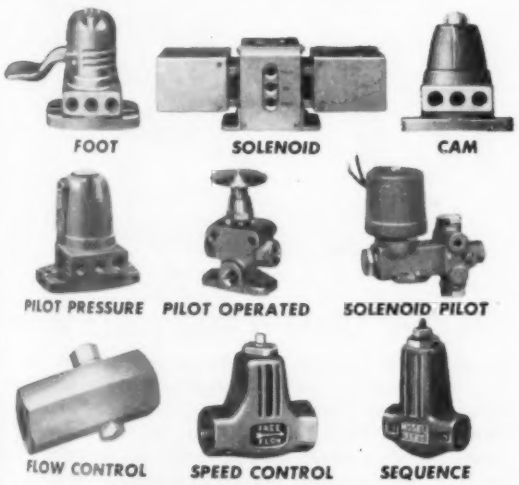
Eliminate breakdown and reduce maintenance by choosing Rivett Valves!

LONG LIFE ASSURED BY SIMPLE, COMPACT DESIGN



—at new low prices!

Flexibility for designing any circuit



Be confident of the continuous, uniform control of air by using any of the complete line of Rivett Air Valves. Design assures easy operation, long life — precludes need of adjustment—prevents leakage. Readily disassembled for servicing or modification.

Recommended for pressures up to 150 P.S.I., these valves are available in 5 sizes: ¼", ⅜", ½", ¾" and 1".

Get this important booklet!

Working drawings, specifications, cut-away views —all data requisite to good circuit layout in these 12 fact-filled pages. Write for free copy today!

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Dept. T-E 2, Brighton 35, Boston, Massachusetts

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RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

Member—National Fluid Power Association

Now in its 7th year

NOPAK Shelf-Stock Service...

based on these 2 Standard Mounting, Class 1, Cushioned Cylinders

LIST PRICES F.O.B. Milwaukee, Wisconsin — Subject to Revision.

Cyl. Dia. Bore	STOCK STROKE LENGTHS — All Double Acting								
	1"	2"	3"	4"	6"	8"	10"	12"	15"
1½"	24.16	25.72	26.08	26.44	27.16	27.88	28.60	29.32	30.40
2"	26.24	27.88	28.32	28.76	29.64	30.52	31.40	32.28	33.60
2½"	32.36	34.12	34.68	35.24	36.36	37.48	38.60	39.72	41.40
3"	35.04	37.28	37.92	38.56	39.84	41.12	42.40	43.68	45.60
4"	40.84	43.68	44.52	45.36	47.04	48.72	50.40	52.08	54.60
4½"	48.96	51.92	52.88	53.84	55.76	57.68	59.60	61.52	64.40
6"	66.60	70.80	72.20	73.60	76.40	79.20	82.00	84.80	89.00
8"	.....	126.80	129.20	131.60	136.40	141.20	146.00	150.80	158.00

By specifying NOPAK Shelf-stock, you buy *quality cylinders* at lowest prevailing prices, you *eliminate waiting* for "specials", reduce engineering costs. Compare the prices and scope of NOPAK Shelf-stock (1½ x 1" to 8 x 15") with competitive offerings — and you *will specify* NOPAK.

● Basic mountings "A" or "E" convertible to "B", "C", "D" or "F", (see below) by changing cylinder heads. Add 10% to above prices (no extra charge 8" bore). ● Piston Rods NF male thread. ● Cushioning can be eliminated on rod, blank or both ends by removing spring and ball-check.

NOPAK 4-Way Valves, hand, foot, solenoid, or pilot operated, to actuate all cylinders, *also in Shelf-stock.*

GALLAND-HENNING NOPAK
2750 S. 31st STREET
MILWAUKEE 46, WIS.

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

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A 8003-½-R

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You take no chances when you choose...

ROUSSELLE

...for it has the speed, accuracy and sturdiness you want — also the features to handle a greater variety of work — along with simpler, more thrifty operation and maintenance... Dollar for dollar you cannot buy a better, more practical press.

Significant savings are often achieved if you let our engineering staff assist you. There is no obligation.

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THE RECORD BREAKER..

M-B "JUNIOR"

75000 R.P.M. PNEUMATIC GRINDER

Model M-CR-B

"JUNIOR" Does a Man's Size Job!

A smaller but husky model that can be used on many operations where a lighter weight tool is advantageous. Stays on the tough jobs day in and day out. 4 TYPES: 2 types of spindle extension; 2 types of air control valves; steel body; grease-sealed bearings; light weight, 12 ounces. Accommodates mounted grinding wheels, rotary files, etc. SPEEDY—Will operate Tungsten Carbide Burs, Rotary Files, etc. to their full efficiency.

Write for Literature

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USE READER SERVICE CARD; INDICATE A-2-234-3

Don't Let Small Parts Clutter Up Your BROACHING OPERATIONS

OIL GROOVES
SMALL SPLINES
SERRATIONS
KEYWAYS
SLOTTING
BURRING
SIZING HOLES

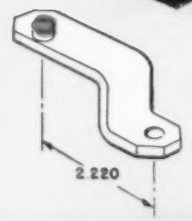
These can all be broached AT FAR LESS COST on Red Ring Self-contained Broaching Fixtures. Use your standard broaching machines for the heavier jobs on which they pay off.

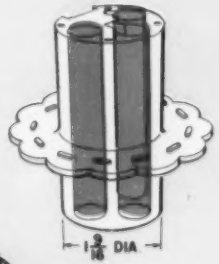
The Self-contained Fixture has its own pneumatic power unit to pull or push the broach. Just set it on a table, connect it to the air line and you are ready to start broaching. Or you may want to mount it vertically to further economize floor space.

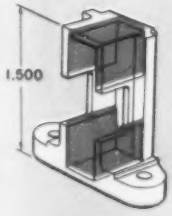
Like other fixtures or dies, these units may be stored in the tool room when not in use. They occupy little space and are easily portable.

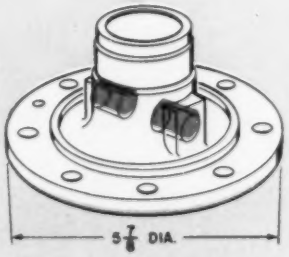
Application is practically unlimited for jobs requiring a "Pull" of 2,000 lbs. or less and a stroke not exceeding 25 inches.

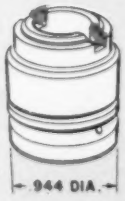
Call a Red Ring Broach Engineer or write for Bulletin B54-9 for more detailed information.

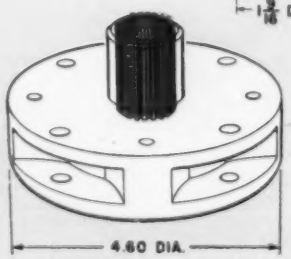












7018

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

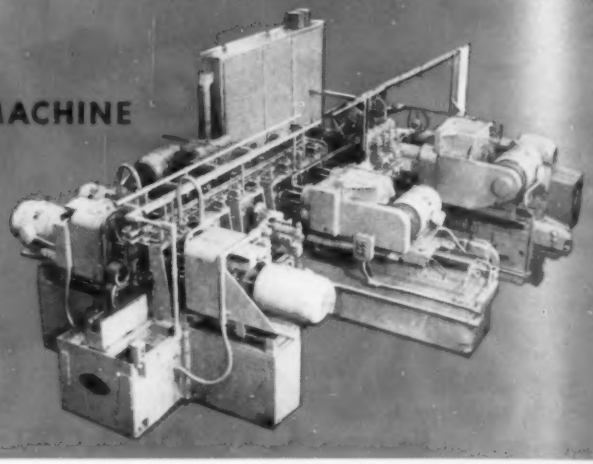
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

10 Station Automatic In-Line TRANSFER MACHINE

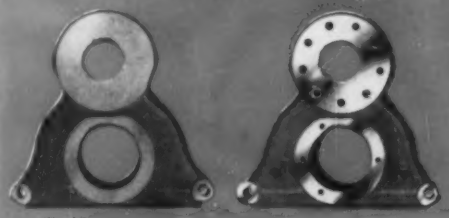
BAKER

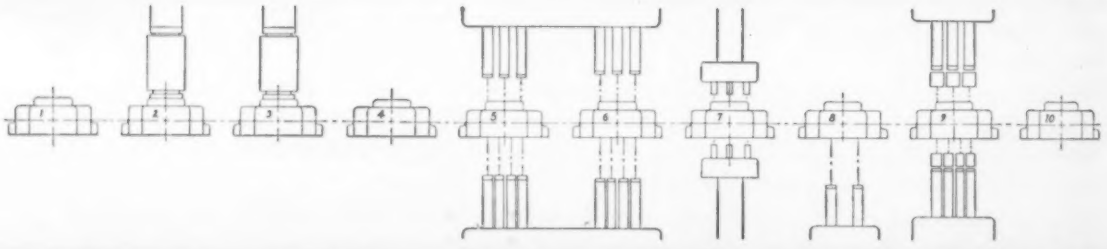
Performs Multiple Operations on Tractor Housings

THE MACHINE



THE PART





THE OPERATIONS

STATION NO. 1
LOAD 1 PART

STATION NO. 2
UNIT NO. 1
COMB. SEMI. FIN. BORE 5.165 & 3.249 & 2.861 DIAS.
COMB. SEMI. FIN. BORE 4.425 THRU BOTH WALLS

STATION NO. 3
UNIT NO. 1
COMB. FIN. BORE 5.180 & 3.264 & 2.876 DIAS.
COMB. FIN. BORE 4.440 THRU BOTH WALLS

STATION NO. 4
IDLE

STATION NO. 5
UNIT NO. 2 "U" DRILL 5 HOLES
31/64 DRILL 6 HOLES

UNIT NO. 3 31/64 DRILL 8 HOLES
21/32 DRILL 1 HOLE
"U" DRILL 6 HOLES
23/32 DRILL 1 HOLE

STATION NO. 6
UNIT NO. 2 ½ CHAMFER 5 HOLES
⅛ CHAMFER 6 HOLES

UNIT NO. 3 ⅛ CHAMFER 7 HOLES
13/16 CHAMFER 1 HOLE
½ CHAMFER 6 HOLES
23/32 DRILL 1 HOLE
COMB. COUNTERBORE
.796 & CHAMFER 1 HOLE

STATION NO. 7
INSPECTION

STATION NO. 8
UNIT NO. 4
.6910 REAM 1 HOLE
.8157 COUNTERBORE 1 HOLE

STATION NO. 9
UNIT NO. 5 7/16-14 N.C. TAP 5 HOLES
9/16-12 N.C. TAP 6 HOLES

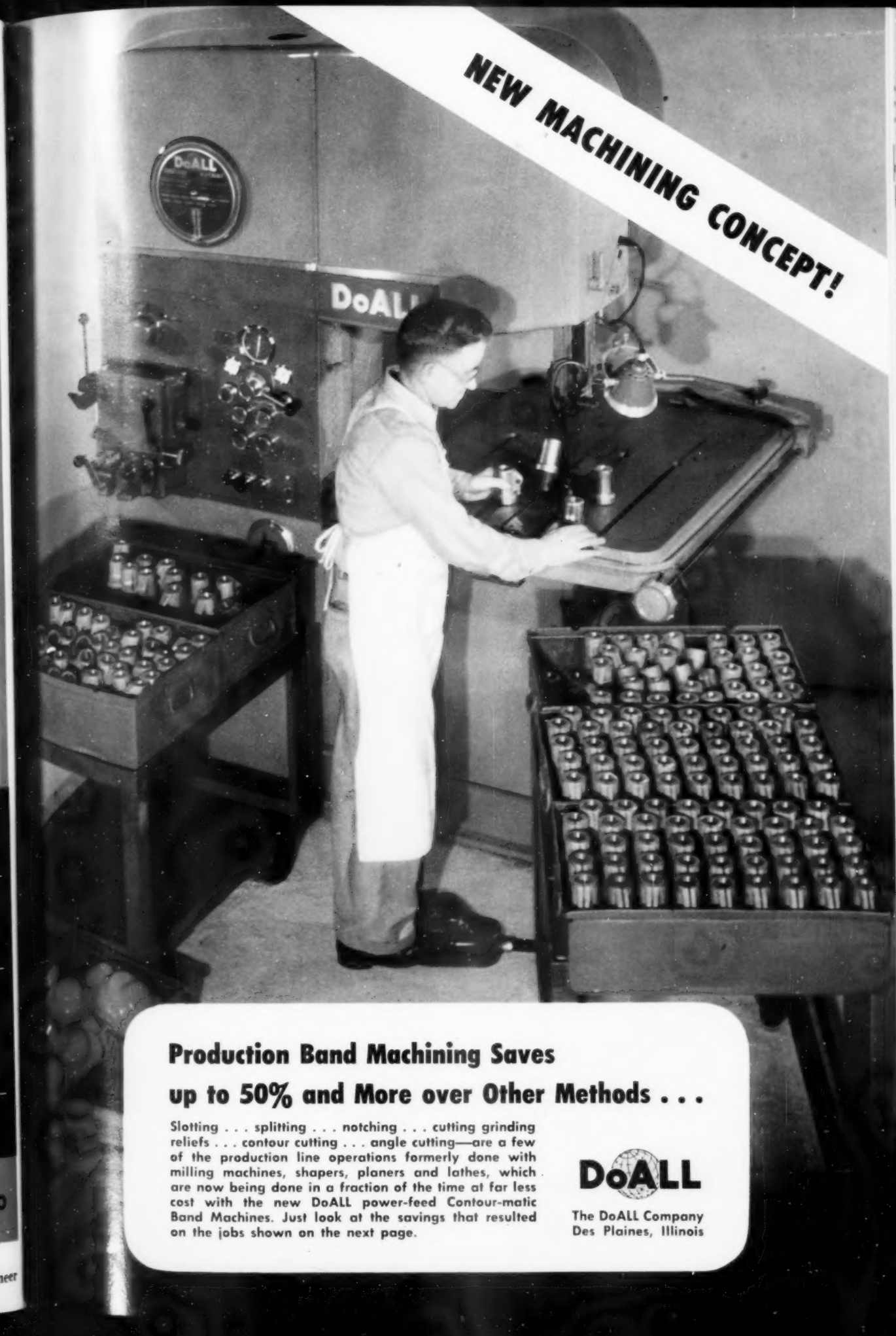
UNIT NO. 6 7/16-14 N.C. TAP 6 HOLES
9/16-12 N.C. TAP 7 HOLES
½-14 N.P.T. TAP 2 HOLES

STATION NO. 10
UNLOAD 1 PART

Whatever Your Specific Job Problem, Consult Baker Engineers. Write

BAKER BROTHERS, INC., TOLEDO, OHIO

DRILLING • TAPPING • KEYSEATING • CONTOUR GRINDING MACHINES



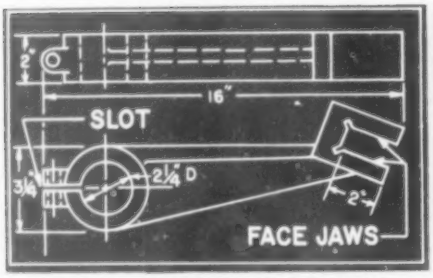
Production Band Machining Saves up to 50% and More over Other Methods . . .

Slotting . . . splitting . . . notching . . . cutting grinding reliefs . . . contour cutting . . . angle cutting—are a few of the production line operations formerly done with milling machines, shapers, planers and lathes, which are now being done in a fraction of the time at far less cost with the new DoALL power-feed Contour-matic Band Machines. Just look at the savings that resulted on the jobs shown on the next page.

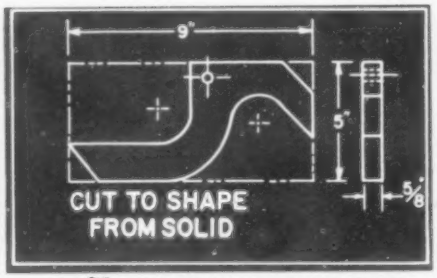
DoALL

The DoALL Company
Des Plaines, Illinois

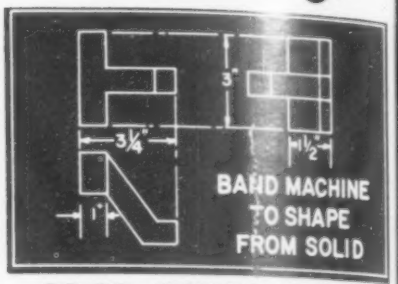
Typical Jobs Done Faster at Lower Cost by DoALL Production Band Machining!



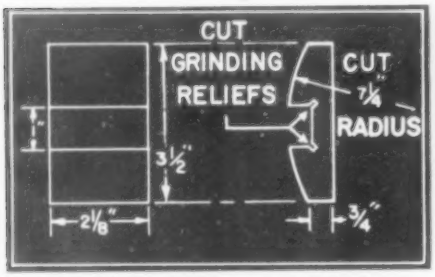
53% TIME SAVING
in cutting .100" slot and facing two 2" x 2" cast jaws. 150 pieces formerly milled in 13.15 hours; now band machined in 6.25 hours.



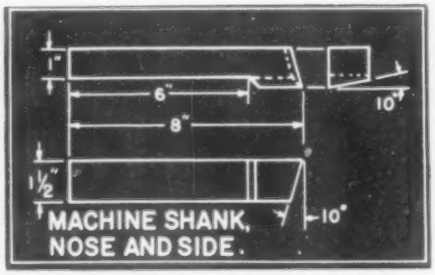
19% TIME SAVING
cutting 175 levers from plate. Formerly torch cut and ground in 29.22 hours; now band machined in 23.62 hours with no grinding required.



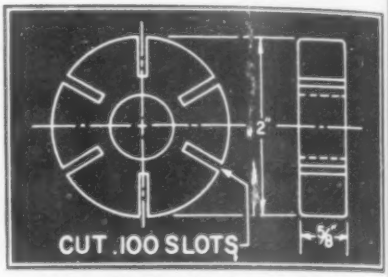
46.28 HOURS SAVED
cutting mounting bracket from solid. 75 pieces formerly shaped in 60.0 hours; now band machined in 13.72 hours—77% time saving.



56% TIME SAVING
in machining radius and grinding reliefs. 50 pieces formerly milled in 3.10 hours; now band machined in 1.35 hours.



58 HOURS SAVED
machining tool shank nose and side. 500 pieces formerly produced in 99.5 hours; now band machined in 41.5 hours.



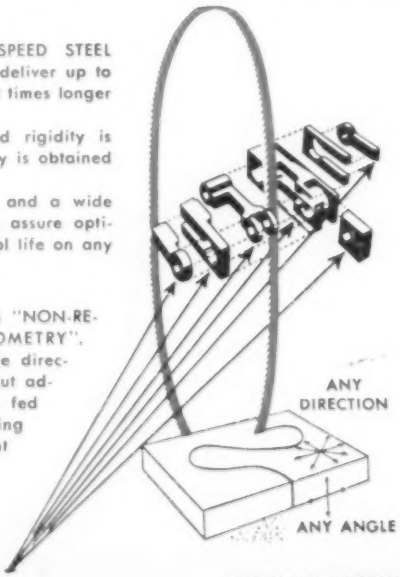
48 HOURS SAVED
cutting .100 x .4375 slots in rotors. 2000 formerly milled in 66.6 hours; now band machined in 18.6 hours—72% less time.

NEW DoALL DEMON HIGH-SPEED STEEL SAW BANDS are available to deliver up to 6 times faster cutting, up to 10 times longer life than carbon steel blades.

Greater machine power and rigidity is now provided. Highest accuracy is obtained —cuts are square and true.

Variable speeds and feeds and a wide range of different band tools assure optimum production, finish and tool life on any machinable material.

THE BAND MACHINE PERMITS "NON-RESTRICTED MACHINING GEOMETRY". There are no restrictions to the direction of cutting action as the cut advances. Hence, work may be fed to the narrow, continuous-cutting band tool along either a straight or "contoured" course. And unwanted material is "sliced off" in whole sections.



New DoALL Contour-matic band machines have opened up an entirely new machining concept. An automatic hydraulic power feed table carries the work into the thin continuous-cutting band tool. Integral recirculating coolant system and air jet promote high cutting rates and long tool life. Cutting forces hold the work down to the table—only the simplest fixtures are required. Tooling cost is far less than for other machine tools. Setup and floor to floor time is greatly reduced.

Faster cutting...lower tooling cost...lower capital investment (a DoALL power feed band machine costs but ⅕ to ½ as much as production milling machines, shapers or planers) — these are the money-saving advantages of DoALL *production band machining*. For complete details call your local DoALL Store—see classified listing in your phone book—or write THE DoALL COMPANY.

NEW FILM "Production Band Machining" now available showing operation of this new machining concept.

ASK FOR FREE DEMONSTRATION at your plant. There is absolutely no obligation—a DoALL Demonstration Unit will pull up in your "back yard" and show you production band machining in action.

'riendly DoALL Stores... (in 40 cities)

Personalized Service...Complete Stocks...Local Delivery

EDUCATIONAL STUDY WALL CHARTS
Economic Principles
$1.00 each postpaid
Lower quantity prices.

Integral Gear Teeth vs. Ring Gear Insert

As Manufactured by
The Steel Products Engineering Co.
Springfield, Ohio

The ability of a Fellows Gear Shaper to cut teeth-against-shoulder gears with complete precision control permitted more economical and weight-saving, one-piece design!

Thanks to the Fellows Method . . . you have more freedom in the design of gears and other parts that will improve the performance of your products.

Fellows Gear Shapers have the versatility to turn out unusual contours . . . special gears, ratchets, splines . . . triangular, square and hexagonal holes. You design it . . . the standard Fellows Gear Shapers can be easily adapted to cut it . . . within close tolerances . . . within reasonable production budgets.

Ask any Fellows Office for the latest facts about Fellows Gear Shapers, Shavers and Inspection Instruments.

For more freedom in the design of gears and other parts, write for our complimentary booklet: The Art of Generating with a Reciprocating Tool.

THE Fellows GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont

Branch Offices: 319 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 3 • 2206 Empire State Bldg., New York 1
6214 West Manchester Avenue, Los Angeles 45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Card proudly introduces a select line of precision gages, with the same quality of manufacture associated with Card taps over the past 80 years. Inspect these gages at your distributor's now.

Contact your local Card Distributor for prompt deliveries and helpful service.

The CARD Quality

S. W. CARD MANUFACTURING CO.
MANSFIELD, MASS.

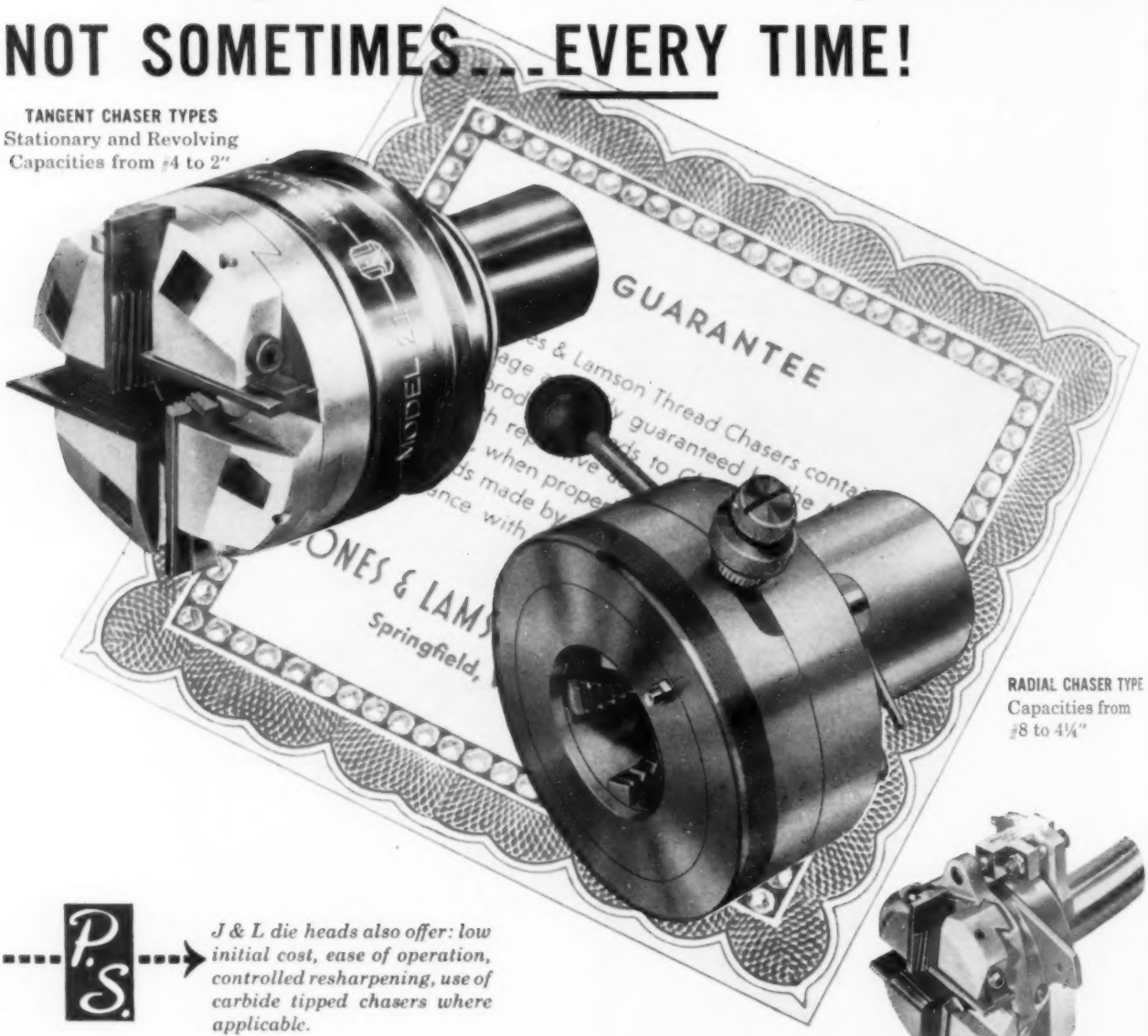
DIVISION OF UNION TWIST DRILL CO.
TAPS · DIES · SCREW PLATES · GAGES

Jones & Lamson dies are your best buy . . . whether you need Class III or not. They give you extra savings because of our system of "no approximation" . . . a factor that also applies to Class I and II. So, whatever your requirements, Jones & Lamson's *written* Class III or better Guarantee means -----

IMPORTANT SAVINGS regardless of tolerance requirements—

NOT SOMETIMES---EVERY TIME!

TANGENT CHASER TYPES
Stationary and Revolving
Capacities from #4 to 2"



RADIAL CHASER TYPE
Capacities from
#8 to 4¼"

FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

P.S. *J & L die heads also offer: low initial cost, ease of operation, controlled resharpening, use of carbide tipped chasers where applicable.*

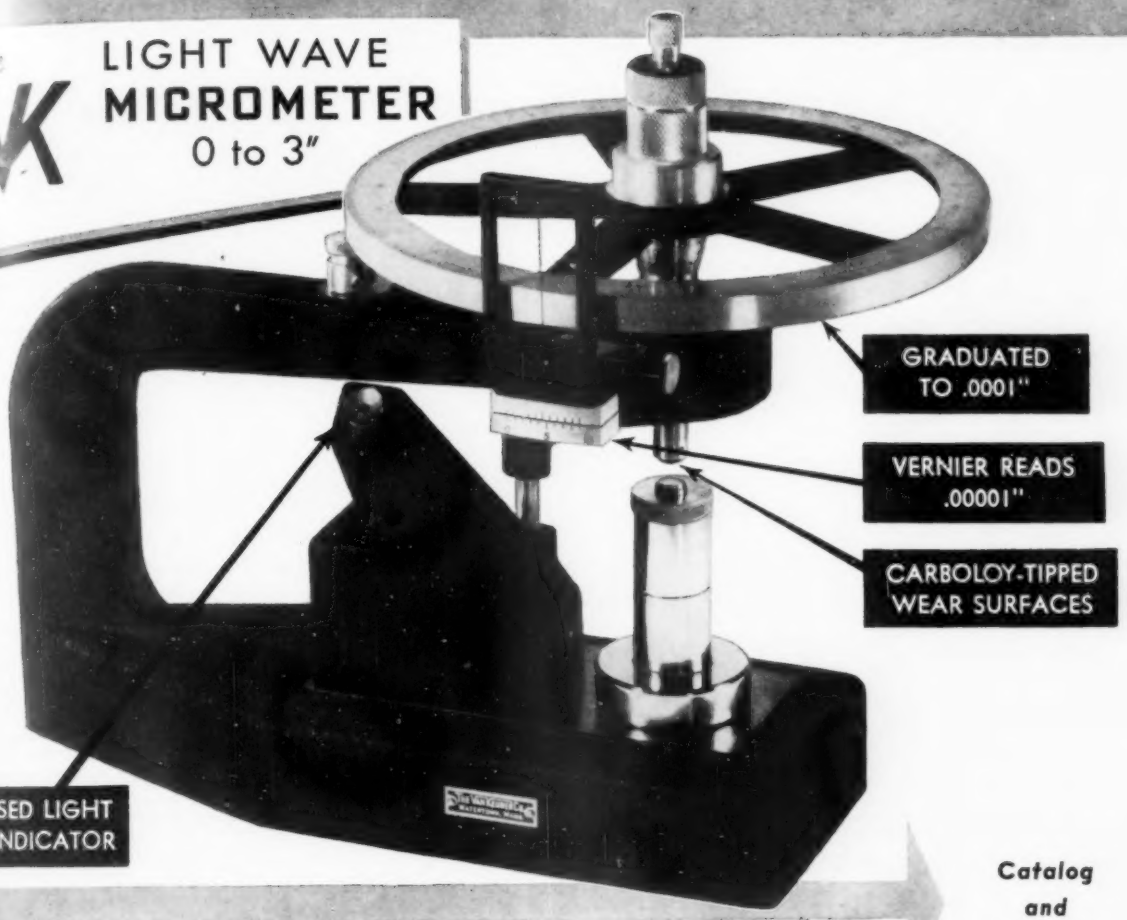
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **THREAD TOOL DIV.**

for that last hundred-thousandth

The VK LIGHT WAVE MICROMETER 0 to 3"



The Van Keuren Light Wave Micrometer is an instrument of exceptional accuracy, ideal for measuring plug gages or small precision parts. Use it when you're after "that last hundred thousandth" involved in so many of today's measurements. The 0 to 3" instrument shown above has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy, and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non-parallax vernier index which enables readings to be made to .00001". It has an index lock and carboloy-tipped anvil and spindle. This sturdy, sensitive instrument weighs only 17 pounds, and is in reality a portable measuring machine of inbuilt and sustained accuracy.

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision . . . fast, accurate and profitable.

Catalog and Handbook No. 35

This 220-page volume represents years of research by the Van Keuren Co. It presents a simple and exact method of measuring screws and worms with wires, tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Ask for your copy . . . sent free on request by writing: The Van Keuren Company, 174 Waltham St., Watertown, Mass.

VK 36th YEAR

THE Van Keuren CO.,

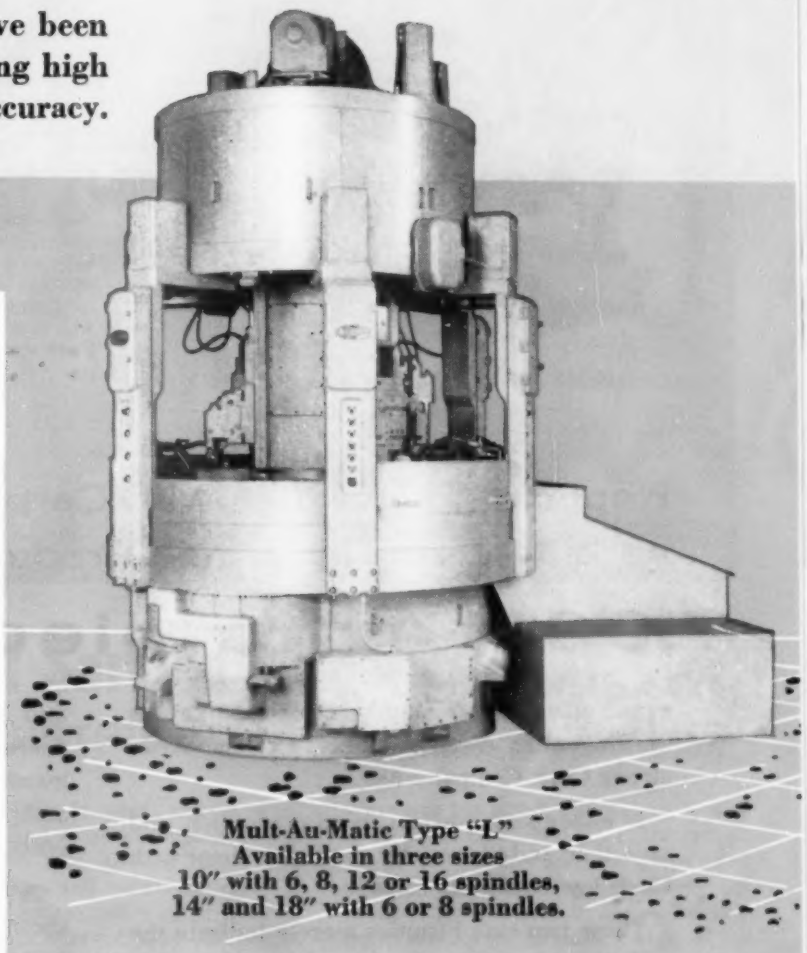
174 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

. . . a new concept of the . . .

BULLARD MULT-AU-MATIC

...ce 1914 Bullard Mult-Au-Matics have been ...idely used in many industries requiring high ...oduction of parts with repetitive accuracy.



Mult-Au-Matic Type "L"
Available in three sizes
10" with 6, 8, 12 or 16 spindles,
14" and 18" with 6 or 8 spindles.

The **MULT-AU-MATIC** Type "L" incorporates many new developments. Here are some of them:

★ CONTROL SYSTEM

All functions of the machine are controlled from conveniently located push buttons with minimum operator effort and maximum safety.

★ FEED MECHANISM

Completely new screw type feed works provide a 16" stroke with 81 feed changes ranging from .0025 to .0625

★ SELECTIVE SPINDLE SPEEDS

At each station, speed range from 35 rpm to 1,000 rpm allows selection of correct cutting speed to suit operation at each station.

★ CARRIER INDEX

New mechanism permits faster indexing of carrier which saves time between cuts.

★ OPTIONAL EQUIPMENT

Includes multi-purpose heads, drill heads, tapping heads, precision boring heads, automatic loading and gauging equipment and chip removal conveyors.

SEVENTY FIFTH
BULLARD
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286 Canfield Avenue • Bridgeport 2, Connecticut

Please send me a copy of the
NEW MULT-AU-MATIC TYPE "L" CATALOG

NAME.....

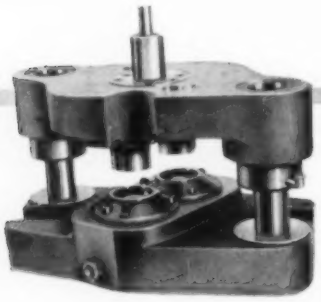
COMPANY..... POSITION.....

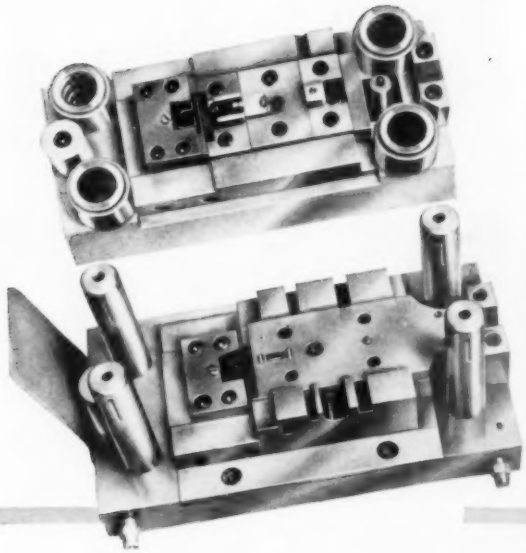
ADDRESS.....

CITY..... ZONE..... STATE.....

For the complete story use this coupon for your copy of the new catalog.

The die shown below is used at the Armstrong Cork Company for blanking and drawing screw bottle caps. Equipped with Carboloy cemented carbide, it operates accurately for months on material .006" thick. Steel dies had to be changed once a week.





Production increased 7,000 pieces per hour, tool maintenance cost dropped two thirds, when Carboloy cemented carbide parts were installed on all four stations of this progressive die set (above). It is used in producing SPEED NUTS® at Tinnerman Products, Inc. Stock is SAE 1060, 13/16" wide and .028" thick. Feed and blank length, .632", operating at 750 strokes per minute.

Replacing steel dies with Carboloy® cemented carbide dies, Tinnerman Products, Inc., obtained...

7,000 extra pieces per hour

THE DIES you use may be complex, like this Tinnerman die. Or simple, like the Armstrong Cork Company die.

In either case, you can speed production, and save time and money, by equipping them with Carboloy cemented carbide.

These two case histories merely indicate the wide range of carbide press-die applications, and their benefits – increased production, decreased maintenance downtime, lower die-maintenance costs, better product-quality control. It all adds up to better products, lower costs, greater customer satisfaction.

A Carboloy Sales Engineer will be glad to show you or your diemaker scores of case histories proving these benefits. He'll show you, too, how simple it is to apply and maintain carbide dies. Write, or send coupon.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

MAIL COUPON TODAY

Carboloy Department of General Electric Company
11101 E. 8 Mile Ave., Detroit 32, Michigan

- ☐ Send me Carboloy Die Engineering Manual D-124
- ☐ Send complete details on Carboloy Training School
- ☐ Have a Carboloy Field Engineer call at my plant

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Company _____

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

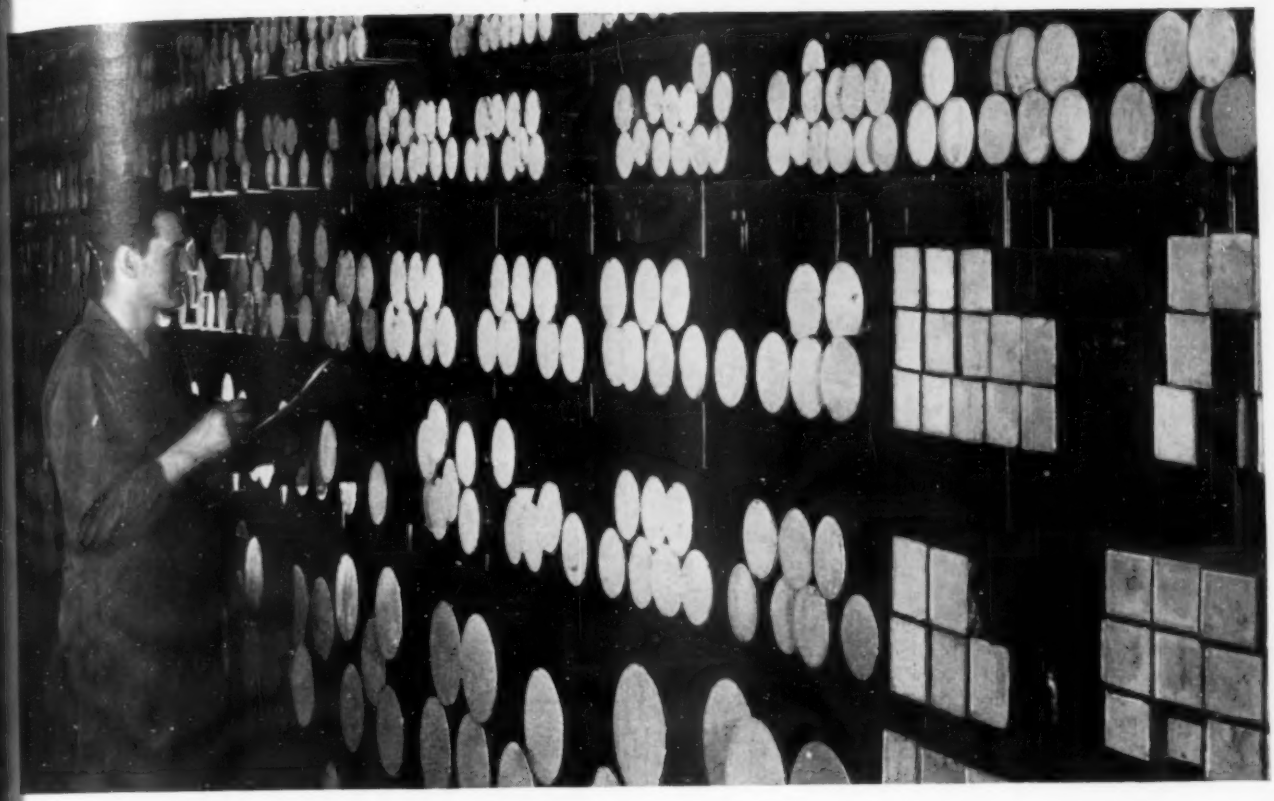
MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS.

Carboloy Created-Metals for Industrial Progress

Tool Steel Topics

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.



Want Fast Tool Steel Service?

SEE YOUR BETHLEHEM DISTRIBUTOR

Whether you want to order a short bar of tool steel, or merely wish advice about some phase of heat-treating, you're sure to find your Bethlehem tool steel distributor anxious to be of service.

For prompt service is your distributor's middle name. Why else does he make it a point to know your city like a book — its background, its people, its industry? He knows what kinds of steels you are most likely to need, and in what quantities. And so he keeps large stocks of Bethlehem tool steel on hand, in a variety of sizes and quantities, ready to go at a moment's notice.

If you want bars cut to special length, or if there's some tricky phase of metallurgy or any other tool steel problem troubling you, again your distributor is at your beck and call. He's a real friend.

66 HS and XX Team Up in Difficult Nut-Forming Application

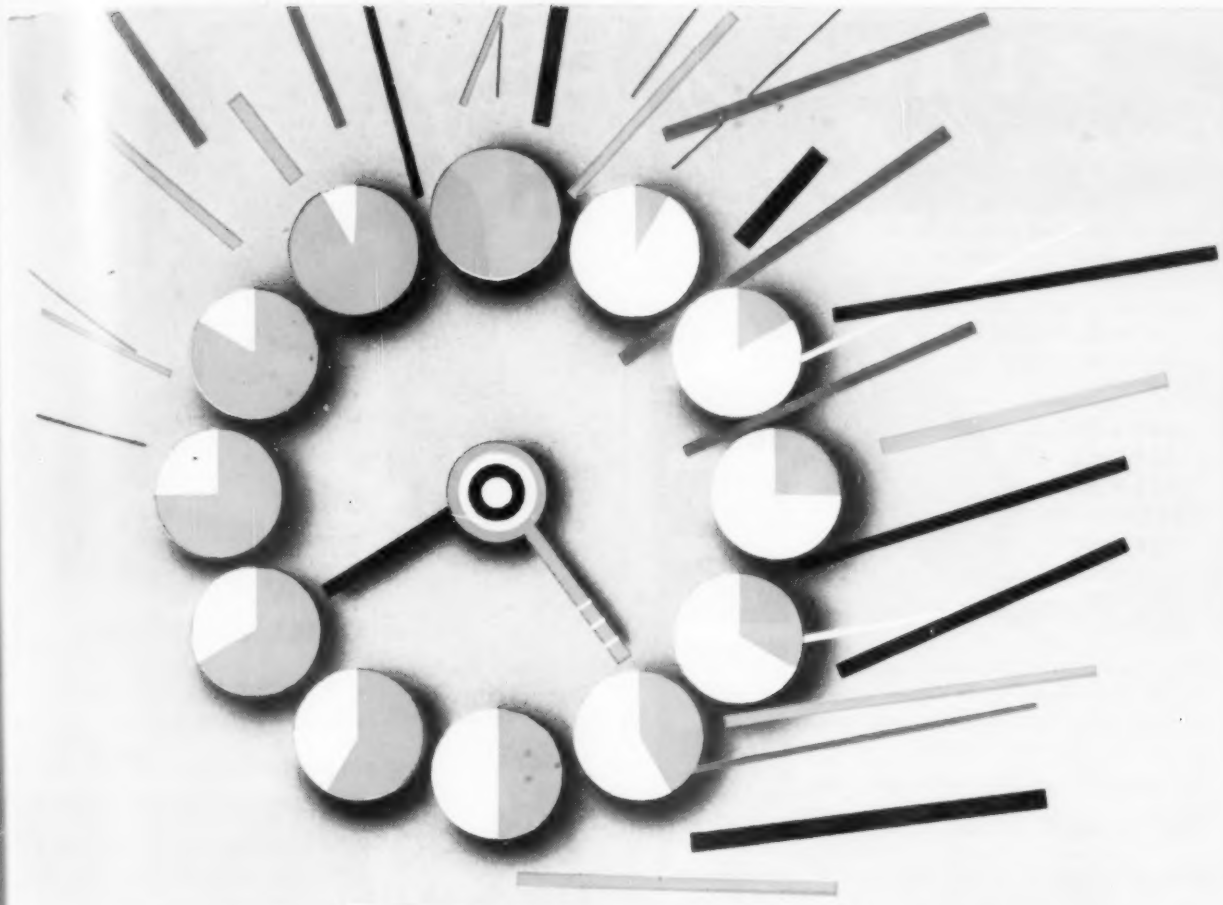
The hexagonal punch and doming die, each quenched and drawn to a Rockwell C hardness of 61-63, are used in a cold-forming operation by a maker of nuts. The punch is made of 66 High-Speed. It is doing an outstanding job in holding close tolerances because of its excellent resistance to wear. The XX Carbon Steel die also provides good wear resistance, as well as resistance to shock, its high surface hardness and tough core enabling it to withstand repeated blows of the punch.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Scale is Tough Stuff

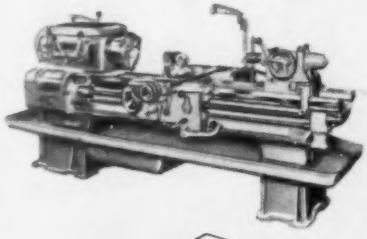
Whenever hot-rolled scaled stock is used in place of cold-rolled stock, the service life of the punches and dies drops to as much as a third of normal, largely because of the abrasion of the scaled hot-rolled surface on the cutting edges of the tools. The peculiarities of each situation determines whether or not such a substitution is economical.

So the question is often asked: What can be done from the tooling end to avoid decreased production? If punches and dies are normally made from water-hardening carbon tool steel, or from manganese oil-hardening steel, decreased tool life can be avoided by changing to a high-carbon, high-chromium steel, such as Lehigh H or S. Such a change would largely overcome the disadvantage of hot-rolled scaled stock. But if high-carbon, high-chromium steels are already being used, effecting an appreciable improvement can be accomplished only through special heat-treatment, such as short-cycle hardening, or nitriding.



the biggest cost item in industry

Your business pays more for man-hours of labor than for any other single ingredient of your product . . . An engine lathe operator usually commands a higher rate than the average worker—added reason for giving him the machine that helps him make the most of his time. That's an Axelson lathe, because Axelson lathes are designed and built to make man-hours mean more. We'll be glad to tell you how and why.



AXELSON
LATHES
make man hours mean more

AXELSON MANUFACTURING COMPANY
DIVISION OF U. S. INDUSTRIES, INC.
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HYDRAULIC CYLINDERS

Thousands of Different Selections
For Immediate Delivery!

Rapidly expanding list of quality-famous Miller Cylinders for immediate, off-the-shelf delivery now includes thousands of different, popular selections—both hydraulic and air—cushioned and non-cushioned.

Bores up through 5″ hydraulic, 8″ air. Strokes up through 18″. Over 30 different mountings.

Larger bores (up through 12″ hydraulic, 20″ air) and longer strokes (up to 22 feet) available on longer delivery.

Miller Boosters also in stock for immediate delivery.

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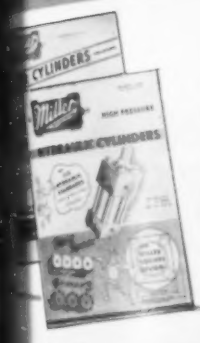
HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly



WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½″ to 20″ bores, 200 PSI operation; low pressure hydraulic cylinders, 1½″ to 6″ bores for 500 PSI operation, 8″ to 14″ bores for 250 PSI; high pressure hydraulic cylinders, 1½″ to 12″ bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

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THE MORE KNOW-HOW YOU PUT IN THE BARREL, THE MORE PROFIT YOU TAKE OUT

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

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Eliminate Costly, Custom-Made Devices!

Provide accurate, pre-set end pressures for every need!

Why waste toolmaker's time machining make-shift devices to provide necessary spring loads? Standardizing on low-cost, ready-made Vlier Spring Plungers speeds jig and fixture manufacture and insures *accurate, uniform* loading, resulting in more accurate machining, fewer rejected parts!

40 TYPES AND SIZES! Hundreds of thousands of Vlier Spring Plungers are now in use positioning parts in dies, jigs, and fixtures, as detents, locating pins, and die ejectors... wherever accurately-controlled, constant spring pressure is needed! *Order a wide assortment of types and sizes from your Vlier distributor today!*

1. **Plunger end telescopes completely within body!** End pressure is determined with plunger end telescoped 50%.
2. **Case-hardened plunger end gives high wear resistance!** Ductile core overcomes brittleness, reduces hazard of failure under impact common with hardened, high-carbon steel.

3. **Large bearing surface** assures perfect alignment at any part of plunger travel, eliminates binding and reduces wear!
4. **Rust-proof finish** prevents freezing in the fixture!

4 Nose Types Available!

Standard Nose—Cylindrical plunger end is accurately radiused to speed loading and unloading of jig or fixture. End pressures available from 3# to 42#; various diameters and lengths.

Silvernose—Cadmium-plated plunger ends identify light (1# to 7#) end pressures. Special spring design developed for fast, repetitive operations; give millions of flexes without fatigue failure!

Hexnose—Plunger end is hexagonal-shaped. Can be easily and quickly installed, adjusted, or removed with an ordinary end wrench! End pressures available from 8# to 12# in Standard type, and from 2½# to 6# in Silvernose type; various diameters and lengths.

Plastic Nose—For use with aluminum, brass, and other soft, easily marred materials. Plastic plunger end reinforced for less deformation under loading. Excellent wear resistance; high dielectric strength. End pressures available from 5# to 18# in Standard type, and 1½# to 7# in Silvernose type; various diameters and lengths.

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TORQUE THUMB SCREWS • SPRING PLUNGERS • SPRING STOPS • FIXTURE KEYS • TOGGLE PADS • KEY KLIPS

Vlier Screw-ball Clamps — Overcome angular irregularities in clamping set-ups. Prevent surface damage. 17 sizes!

Vlier Key Klips—Eliminate lost hex keys! Speed positioning of part in fixture. 3 sizes!

Vlier Torque Thumb Screws—Apply accurate, controlled end pressures to the workpiece. 4 models; 19 sizes!

Vlier Spring Stops—For use where there are no wall sections in fixture. Two models: 14 and 32 lbs. end pressure.

Vlier Toggle Pads—Assure clamping of parts with irregular surfaces. 5 sizes: for use with standard screws, toggle clamps and pliers.

Vlier Fixture Keys—New 5-Way Key fits all common mill table slots. 3-Way model also available.

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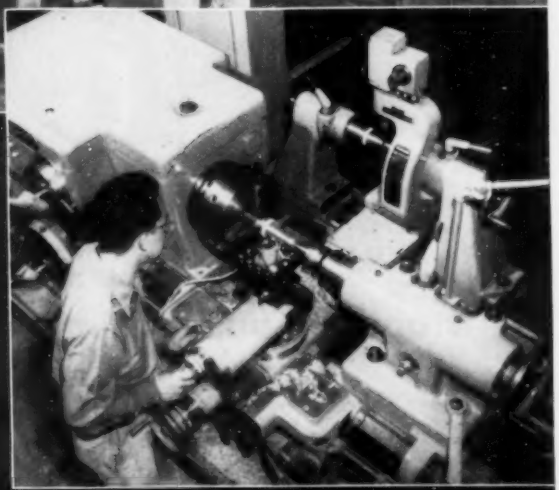
"EXPERIENCE WITH THE SIDNEY 20" TRACING LATHE IN DEPARTMENT B6-406 OF THE DOUGLAS EL SEGUNDO, CALIFORNIA DIVISION INDICATES A CONSIDERABLY IMPROVED PRODUCTION CAPACITY. THE TRACING LATHE WE ARE OPERATING ELIMINATES HUMAN ERROR AS FAR AS LINEAL DIMENSIONS ARE CONCERNED."

DOUGLAS AIRCRAFT CO., INC.
EL SEGUNDO, CALIFORNIA DIVISION

Photographs show Sidney Tracer Lathe making a tapered cut on airplane arresting hook tube.



The tracer head pictured . . . the "brains" of the tracer . . . imparts all impulses to the various operating units as it follows along a template or master piece relating to these units their necessary functions in order to produce the work at hand.

One piece or a million . . . it's all the same to the Sidney Tracer Lathe . . . and all the work pieces are the same . . . every time.

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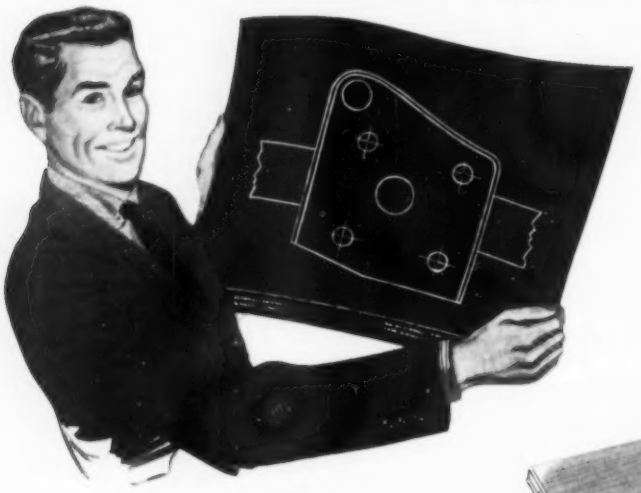
THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904

Keller Multiple Nut Setters

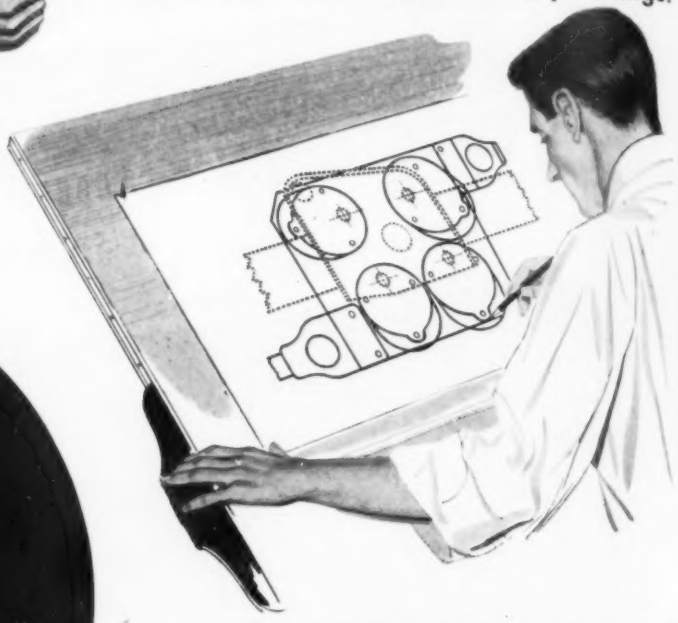


From the bolt pattern on your own blueprint

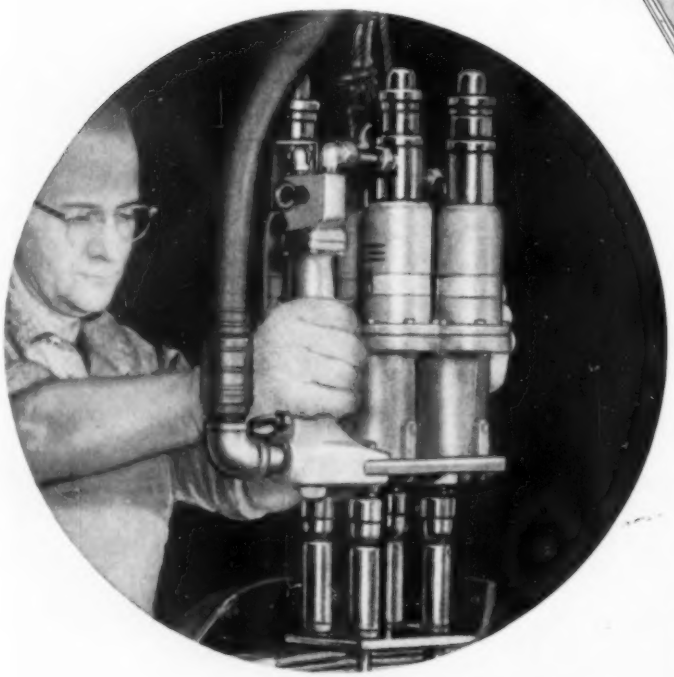
achieve

ACCURATE TORQUE CONTROL and FAST RUN-DOWN

on multiple nut setting operations in the 4 to 140 foot-pound torque range.



. . . a tool design that meets your needs



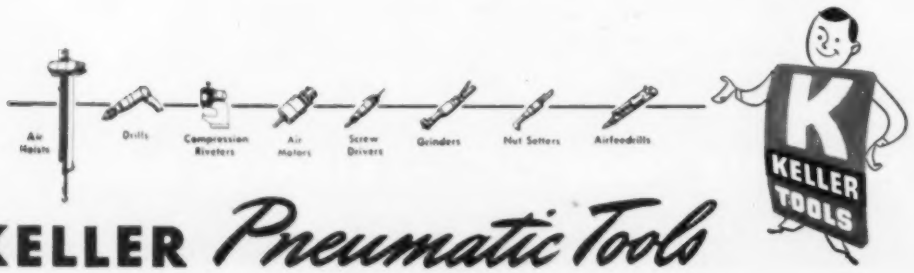
. . . and a complete Multiple Nut Setter built up with standard unit assemblies

Do you have a nut setting problem involving a reduction in time or the maintenance of accurate torque control in setting two or more nuts? Then let our field engineer show you how Keller Multiple Nut Setters can solve this type of problem.

On your own blueprint of the job, he will lay out the complete tool—showing size and location of motor units and handles, and an outline of the mounting plate.

From this layout, Keller builds up the complete Multiple Nut Setter from standard units (only the mounting plate is special). You have a tool engineered to your specific job—with economies gained from standard unit construction.

For catalog information, ask for Bulletin No. 12.



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BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

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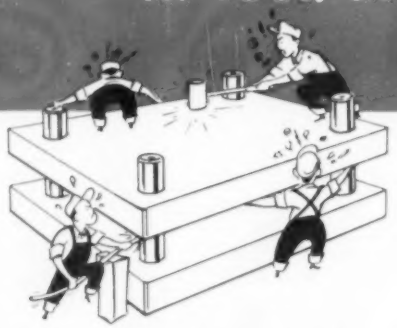
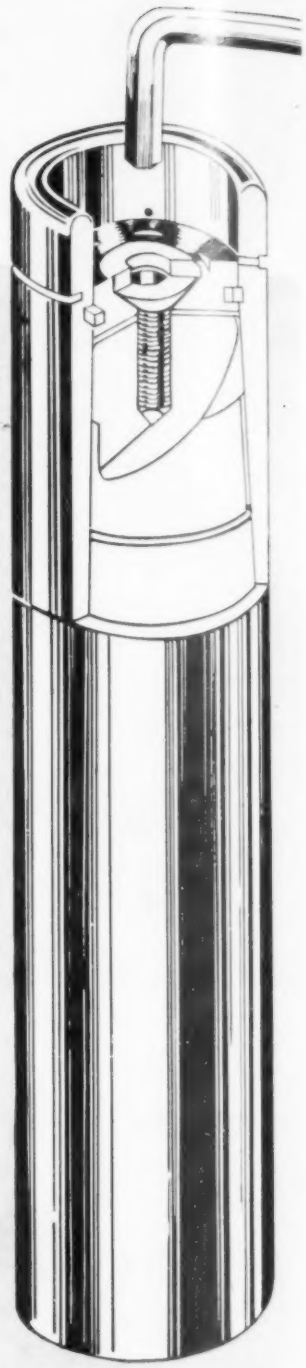
IN YOUR DIE SHOP...



SUPERIOR

REMOVABLE CAP
GUIDE PINS



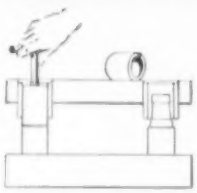
End Troublesome Binding in Die Set Assembly

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.

THESE ADVANCED TYPE GUIDE PINS ARE STANDARD EQUIPMENT ON ALL SUPERIOR DIE SETS

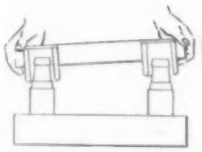
Write, Phone or Wire for Complete FREE Information.

FAST



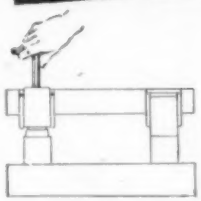
REMOVING CAP

SAFE

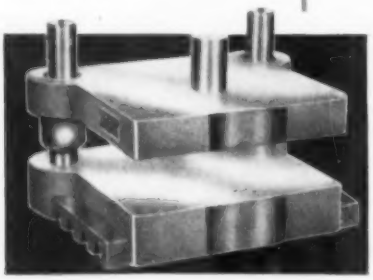


PARTING DIE SET

ACCURATE



REPLACING PUNCH HOLDER



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Only SUPERIOR
Precision — All Steel
DIE SETS
Give You SAFER, FASTER, EASIER HANDLING

Safety Features of Superior die sets eliminate the dangers of injuring hands of skilled die makers, ruining costly dies or damaging press equipment. Speed up handling from bench to press.

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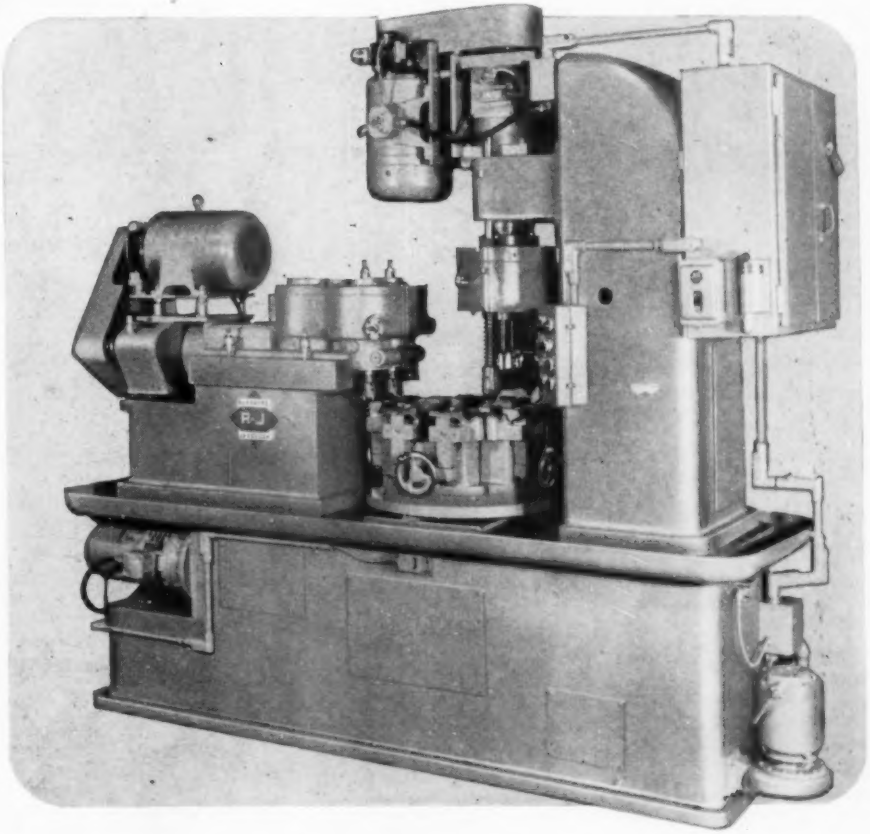
SUPERIOR STEEL PRODUCTS CORP.
2734 S. 19th ST., MILWAUKEE, WIS

Rehnberg-Jacobson

SPECIAL AUTOMATIC-INDEX MACHINE MILLS FACE AND DRILLS FOUR SCREW HOLES IN AUTOMOBILE ENGINE PARTS

Comparatively simple pieces like this are more and more frequently being put on special machine tools for greater production at lower costs. Rehnberg-Jacobson machines are especially adaptable to work of this sort because of their uncomplicated construction, ingenious tooling, use of standard units, and high salvage value.

This cover for the oil filter pad on an automobile engine cylinder block is an ordinary casting requiring only simple operations — facing, and drilling four holes for the holding screws. These dissimilar operations have been cleverly combined on the R-J automatic machine shown below. Each fixture on the motor-driven index table holds two pieces, located from the bosses and clamped by a handwheel. At the first working position, two face mills finish the surfaces; at the next working position, an 8-spindle head drills all the 13/32" holes. The milling head is a special R-J unit with right-angle drive to the vertical cutter spindles and automatic feed to traverse the cutters across the work. The drilling is done with a standard Rehnberg No. 45 Drill Unit having a special multiple-spindle head designed and built by Rehnberg-Jacobson. Production rating is 288 pieces per hour.



REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

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ROCKFORD, ILLINOIS

"Constant Quality" Tungsten Carbide From The World's Newest Carbide Plant

New methods . . . fresh ideas . . . specially designed equipment . . . top carbide engineers . . . three years of thorough planning and perfecting to bring you *"CONSTANT QUALITY"* TUNGSTEN CARBIDE.

Valenite's performance has been proved by long runs on some of the country's toughest cutting jobs. It has what it takes to stand the gaff, hour after hour, day after day.

Valenite will show you on your production line what "Constant Quality" can save you in time and money.

Write for Valenite's complete catalog of "Constant Quality" carbide tips and tools.

Please send without charge the new Valenite Catalog—A-2

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

VALENITE

METALS CORPORATION

Box 205 • Royal Oak, Michigan

SAVE MACHINING COSTS —WITH NEW DISSTON HOT ROLLED STAINLESS STEEL SHAPES

Here's big news to *Stainless* users—especially those in the jet engine and automotive fields. From Disston—leaders for 100 years in the rolling of special shapes—comes a new specialized skill to help you solve rising costs of metal shaping. After years of experimentation and over a year of volume deliveries, Disston is ready to supply complex *stainless* steel shapes to *your* specifications.

Why not discuss your problem with Disston. Find out just how much you can save with this modern production technique. Write or call: Henry Disston and Sons, Inc., Steel Sales Division, 292 Tacony, Philadelphia 35, Pa., U.S.A. Disston makes stainless, carbon, alloy and tool steel in either standard or special shapes.

DISSTON
HAS THE EDGE®

in special purpose steels and special steel shapes.

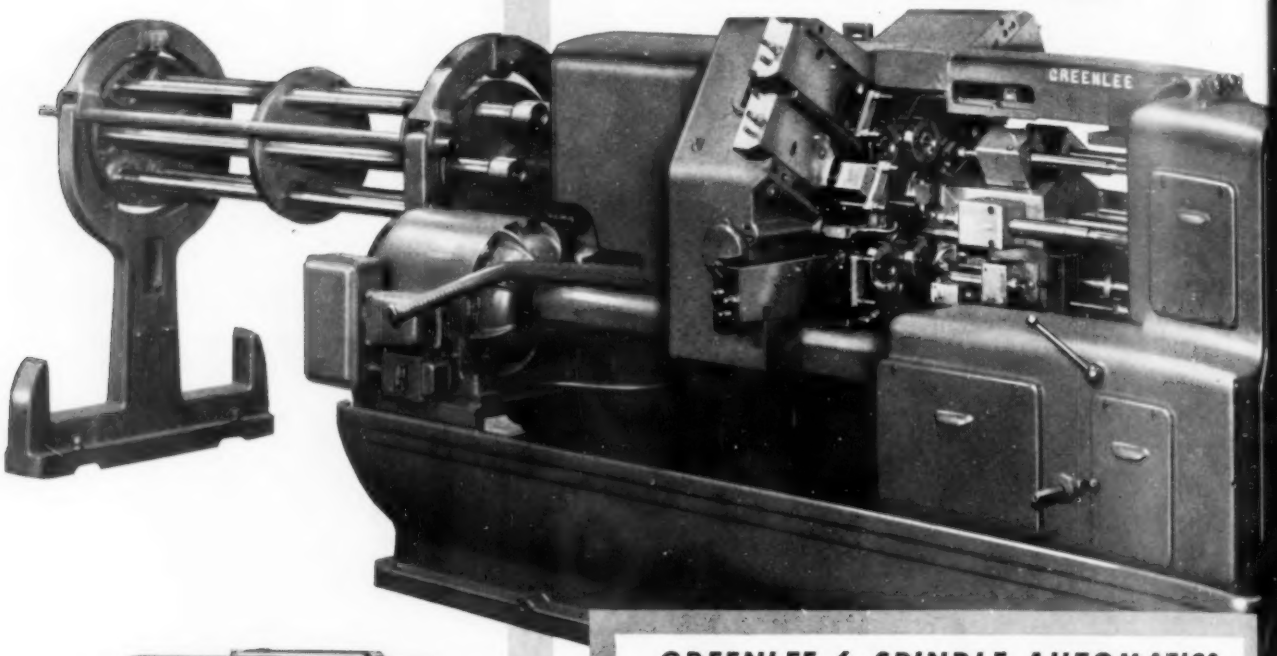
PRODUCTION MACHINERY

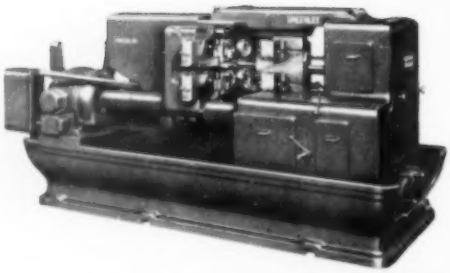
GREENLEE

AUTOMATIC BAR MACHINES

INCREASE YOUR PRODUCTION.. LOWER YOUR COSTS!

CUT YOUR SET-UP TIME
SPEED-UP DIFFICULT OPERATIONS





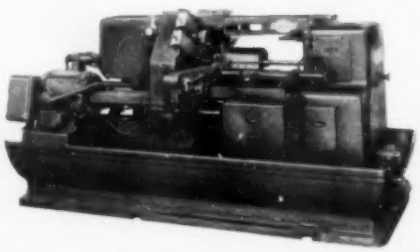
GREENLEE 6-SPINDLE AUTOMATICS
SPECIFICATIONS

Rating	1"	1-5/8"	2"
Chuck Capacity, Round	1"	1-5/8"	2"
Chuck Capacity, Hexagon	7/8"	1-13/32"	1-3/4"
Chuck Capacity, Square	3/4"	1-1/8"	1-7/16"
Stock Feed	6-3/16"	8-5/16"	8-5/16"
Turning Length	6"	7-1/2"	7-1/2"
Spindle Speed Range	225 to 2500	105 to 2175	95 to 1935
Feed Range per Spindle Rev.	.0014 to .0218	.0017 to .0388	.0019 to .043
Motor Horsepower	15	20	25
R. P. M.	1800	1800	1800
Floor space:			
Length with Stock Reel	17'-6"	17'-3"	17'-3"
Width	5'-0"	5'-4"	5'-4"
Height	4'-11"	5'-4"	5'-4"
Net Weight in Pounds	14,400	17,940	18,150

GREENLEE 4-SPINDLE AUTOMATIC
SPECIFICATIONS

Rating	2-5/8"
Chuck Capacity, Round	2-5/8"
Chuck Capacity, Hexagon	2-1/4"
Chuck Capacity, Square	1-7/8"
Stock Feed	8-3/16"
Turning Length	7-1/2"
Spindle Speed Range	120 to 1200
Feed Range per Spindle Rev.	.002 to .0458
Motor Horse Power	20
R. P. M. of Motor	1800
Floor Space:	
Length with Stock Reel	17'-3"
Width	5'-4"
Height	5'-0"
Net Weight in Pounds	17,000

GREENLEE 2ND OPERATION AUTOMATI



Extremely versatile, high-p
duction machines. Parts can
loaded semi-automatically
fully automatically. Incorpor
the same basic features
herent production and opera
advantages as the standard
Spindle Automatics.

INVESTIGATE NOW
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ROCKFORD, ILLINOIS
3-4881

PRODUCTION MACHINERY

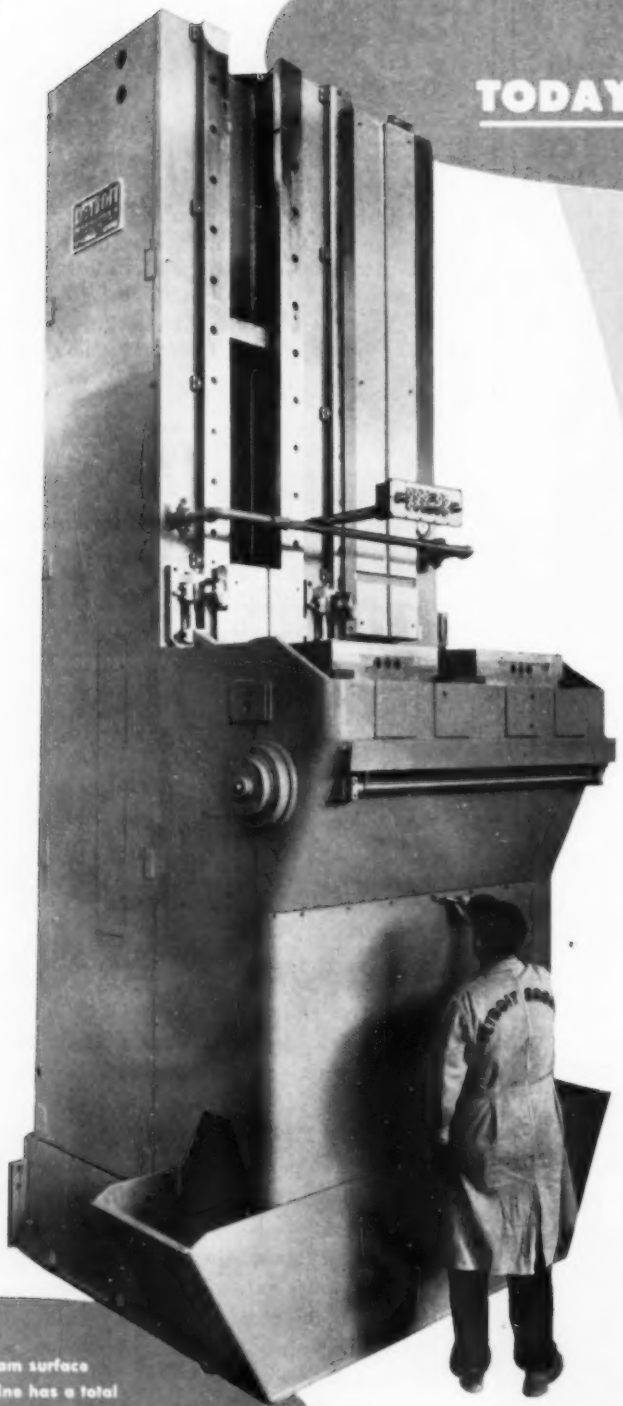
GREENLEE

GREENLEE BROS. & CO.
1982 MASON AVENUE
ROCKFORD, ILLINOIS

TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 169.

Detroit BROACHING MACHINES

BUILT FOR TODAY'S and Tomorrow's BROACHING NEEDS



This huge dual ram surface broaching machine has a total tolerance of .0005" run out throughout its 100" stroke. Machine was designed and built to lick a particularly tough broaching problem . . . furnished with complete carbide tooling.

Detroit Broach is building the finest in broaching machines . . . machines that are designed to make easy the broaching of today's "miracle metals." All of the experience and knowledge obtained from many years as a pioneer and leader in the design and manufacture of broaching tools has gone into the development of these "years ahead" machines.

Detroit broaching machines are sturdy and rugged in construction . . . designed to withstand high broaching speeds in the toughest of metals. The complete line is available in a wide range of sizes with strokes from 6" to 100". Many advanced engineering features are incorporated, such as oilgear hydraulic equipment, automatically adjusted shuttle tables and precision slides.

COMPLETE BROACH SERVICE

For many years specialists in broaches and broach tooling exclusively, Detroit has unmatched experience and facilities to offer for broach tooling also. Thus, you can place complete responsibility for your entire broach needs in the hands of one competent organization. The result is consistently greater production economy, efficiency and precision.

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

✱INSERTED TOOTH SAW

For heavy production cutting of steel, brass, copper and aluminum. Alternating square and beveled teeth "tri-vide" chips for easy cutting and clearance. Maximum saw clearance gives cooler, freer cutting . . . permits extremely high rate of feed. High Speed Steel Teeth can be easily replaced singly or in complete sets, in your own plant.

✱SEGMENTAL SAW

For especially smooth cuts on production work. Extra-service High Speed Steel toothed segments are securely held in a tough alloy plate by a tongue and groove design, have quick clearance for faster, freer cutting. Teeth are alternately square and beveled for easy cutting and clearance of "tri-vided" chips. Can be sharpened on any automatic grinder.

✱SOLID TOOTH SAW

For general shop cut-off jobs . . . for use on smaller automatic cut-off machines, and for cutting jobs where narrow kerf is important. Clearance ground and furnished in High Speed, Si-Maloy (Pat.), or Semi-High Speed Steel. Simonds own steel, plus accurate heat treating and grinding give these saws longer life, more dependable performance.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

For Fast Service from Complete Stocks

Call your
SIMONDS
Industrial Supply
DISTRIBUTOR

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon • Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y. • Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

CIRCULAR Metal Cutting SAWS

a practical approach to pressroom modernization

Announcing

TWO NEW Verson PLANS

to solve press obsolescence problems

The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the fair profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you are one of the manufacturers faced with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problems.

Customized

INSTALLMENT PROGRAM

For the manufacturer who wishes to own his own presses but minimize his initial capital outlay, Verson offers a Customized Installment Program. It is called "Customized" because the payment plan is tailored to the buyer's own financial requirements rather than to a single fixed plan. Initial payments may be as low as 10 per cent of the purchase price with the balance payable over periods ranging from six months to five years. Further information on a plan to meet your needs will be furnished on request. Please outline your requirements.

Customized

LEASING PROGRAM

For the manufacturer who wants the advantages of modern, efficient presses without capital investment, Verson offers a Customized Leasing Program. Like the Installment Program, a choice of plans is available to best suit the buyer's requirements. In addition to the basic plans, options for continuation, termination and eventual purchase are also available. Special arrangements for special machines will be considered. Further information on a leasing plan to suit your needs will be furnished on request. Please outline your requirements.

A Verson Press for every job from 60 tons up.

Verson

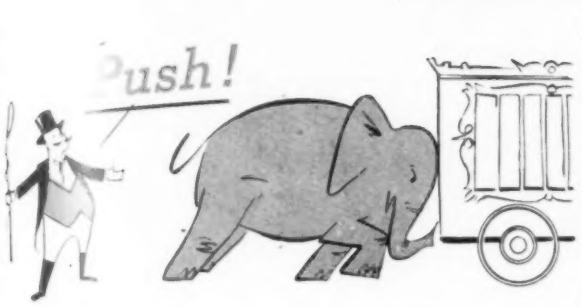
ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

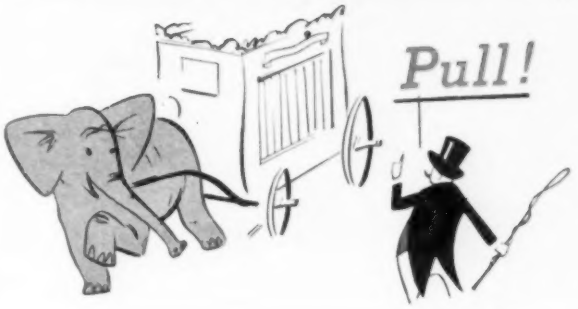
VERSON ALLSTEEL PRESS CO.

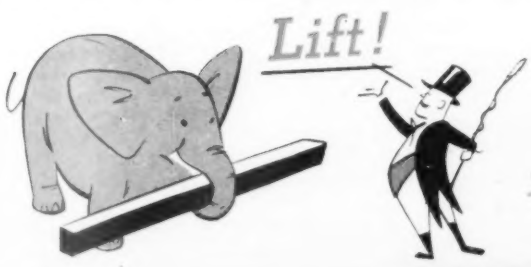
9336 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

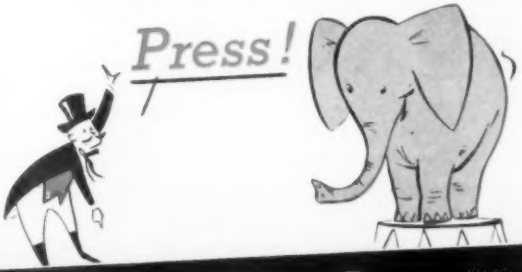
MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

get controlled POWER









with Hanna L-P Cylinders
LOW PRESSURE

All the power in the universe is of no use to anyone unless it's controlled. Hanna L-P Fluid Power Cylinders provide simplified, precision control of power ranging from a few pounds to fifteen tons. Their exclusive design and construction features assure dependable control of power that's carefully matched to the motion required. These sturdy cylinders are available in a variety of standard mounting styles to meet specific requirements. Note the exclusive Hanna features that contribute to their superior performance. Better still, refer your power motion problems to a Hanna engineer. You'll find him listed in your local classified telephone directory. And you'll find him well qualified to help solve your problems economically and efficiently.

CONTROLLED POWER HANNA FEATURES:

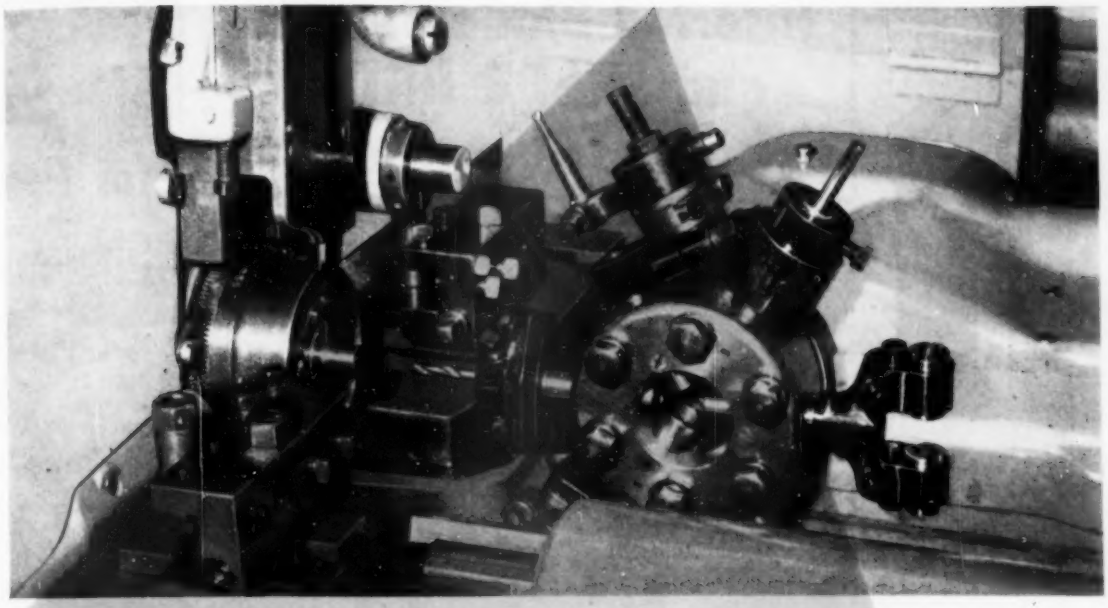
- Cup-type piston packings are synthetic impregnated leather for maximum flexibility with minimum porosity. Spring-backed to assure uniform contact with tube. Packings are chrome-tanned to provide smooth finish and minimize friction.
- Self-adjusting "V" type rod packings are spring-backed to automatically compensate for wear and permit solid fit of gland to front head.
- Cushion sleeves are made of bronze to insure long life and inhibit corrosion. Cork washer facilitates cushion alignment with head and acts as seal.
- Replaceable ball-type check valve is made of bronze for corrosion resistance and maximum life. Designed for a quick start under full power on return piston stroke.
- Brass, non-corrosive cylinder tube with smooth bore contributes to long life of piston packings.

Send today for Hanna catalog . . . No. 236

Hanna Engineering Works

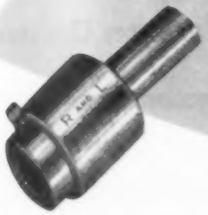
1768 ELSTON AVENUE • CHICAGO 22, ILLINOIS

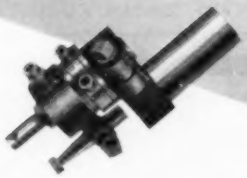
HYDRAULIC AND PNEUMATIC EQUIPMENT • CYLINDERS • VALVES • RIVETERS

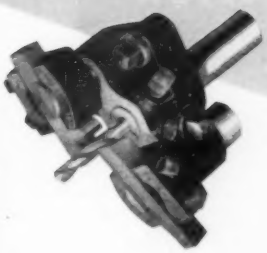


A MACHINE IS ONLY AS GOOD AS THE TOOLS USED ON IT!

FOR PRECISION AND ECONOMY — R and L TOOLS ARE UNBEATABLE







That is why leading manufacturers* supply R and L TOOLS as original equipment with their machines. We know of no finer testimonial, with the possible exception of the fact that last year 86.7 of all R and L TOOL orders were ***repeat orders*** . . . Satisfied customers who wanted more of the precision, time-saving and money-making qualities built into every R and L TOOL.

*List of manufacturers supplied on request.

Write for new catalog

CLIP AND MAIL THIS COUPON

R and L TOOLS
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog

☐ Please arrange for no-obligation demonstration of R and L TOOLS

NAME .....

COMPANY .....

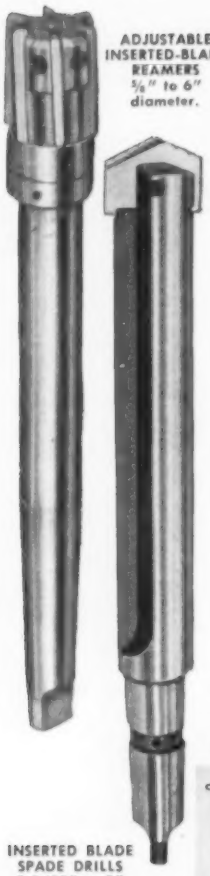
ADDRESS .....

TE-2

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL



ADJUSTABLE INSERTED-BLADE REAMERS 5/16" to 6" diameter.

INSERTED BLADE SPADE DRILLS 1-1/32" to 5" diameter.

Inserted Blade Reamers and SPADE DRILLS Help You Cut Tooling Costs

The *inserted blade feature* of Waukesha Reamers, Counterbores, Spade Drills and Special Tools has proved its economy in thousands of applications, in more than a quarter century of service. This feature — combined with their adjustability and their ability to produce *more-holes-per-grind* — make them a valuable aid in the continuous effort to reduce overall tooling costs in your drilling, reaming and boring operations.

Consult Waukesha . . .

for Competent Cutting Tool Counsel — for qualified assistance in adapting standard Waukesha Tools to your needs — or in developing special tools for your special tooling requirements. Write for Waukesha Tool Catalog.

Representatives in Principal Cities

WAUKESHA TOOL CO. WAUKESHA WISCONSIN

Manufacturers of Carbide and High Speed

INSERTED BLADE REAMERS • SPADE DRILLS • TAP DRIVERS
BORING BARS • COUNTERBORES • FLOATING TOOL HOLDERS • SPECIAL TOOLS

IN STOCK for Prompt Shipment

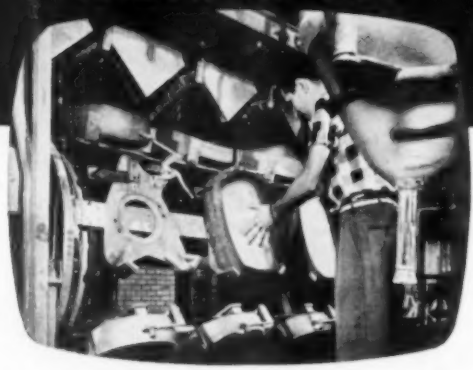
Most standard sizes of WAUKESHA Inserted Blade Reamers and Spade Drills are available for immediate shipment from shelf stock. Write today, for Catalog, Inventory of Sizes, and Current Prices.

Attractive Discounts offered on Certain Sizes for Inventory Clearance

A 7916-1

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-270-1

LAPEER CLAMPS BOOST TV TUBE PRODUCTION 15-20% AT RCA



Operator placing a tube in position. Note the Lapeer clamps.

At Radio Corporation of America, Lapeer special kinescope clamps are paying off in stepped up production in applying the phosphor to the faces of TV picture tubes. Gains from 15 to 20% have been registered.

Boosted output is obtained through the compact design of Lapeer clamps—permitting closer spacing and the installation of more fixtures on the traveling belts used in the operation.

Because the coating on tube faces must dry evenly, without ripples, it is important, too, that there be no vibration during clamping. Easy to operate, Lapeer clamps overcome this hazard. It's probable that Lapeer experience can help solve your clamping problems, too. Write for catalog—today.

Sales offices in principal cities—Teletype DE 49

KNU-VISE PRODUCTS **LAPEER MFG. CO.**

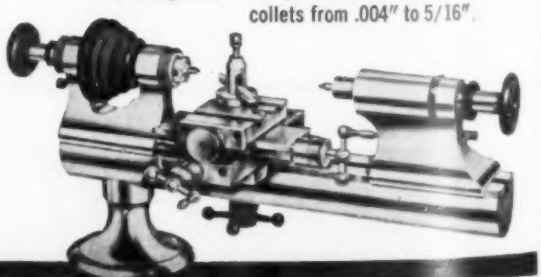
3053 DAVISON ROAD • LAPEER, MICHIGAN
WESTERN DIVISION: 422 MAGNOLIA, GLENDALE, CALIF.
CANADIAN DIVISION: HIGGINSON ENGINEERING, HAMILTON, ONT.

4122

USE READER SERVICE CARD; INDICATE A-2-270-2

SMALL INSTRUMENT PARTS ARE MADE BEST ON *LEVIN* LATHES

Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



Send for Catalog L describing Lathes for tool work, second operations; turrets and full line of accessories.

LOUIS LEVIN & SON, INC., 3610 S. Broadway, Los Angeles 7, Calif.

USE READER SERVICE CARD; INDICATE A-2-270-3

spot the champ

. . . and with high speed steels the champion's always REX

Compare the freckles and you'll pick the champ. And it's easy to spot the champ in high speed steels, too, for Crucible REX® has been the *standard of comparison* for over half a century.

Prove the reasons for REX's superiority in your own shop. You'll like its hardenability. . . response to heat treatment . . . fine tool performance. Like thousands of other users, you'll agree *you can't find a high speed steel to outperform REX.*

Ask for REX, a *prescription-made* Crucible product, at Crucible warehouses or leading distributors from coast to coast. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Coming—in March! The first ASTE WESTERN industrial exposition

Los Angeles Shrine Auditorium and Exposition Hall

With...

...HUNDREDS OF EXHIBITS of Tools • Machines • Supplies Processes • Equipment to cut costs and increase your production . . . exhibits tailored to the needs of Western Industry.

. . . and THOUSANDS OF KEY PRODUCTION EXECUTIVES, Tool Engineers and other buyers attending who *need* these exhibited products for their own plant expansion and increased production.

THE WEST'S BIGGEST INDUSTRIAL EXPOSITION . . . over 80,000 square feet of exhibits . . . running concurrently with the

MOST VITAL ALL-INDUSTRY PRODUCTION CONFERENCES the West has ever known . . . *held on the site of the show* with the cooperation of other technical societies and trade associations.

For complete information contact ASTE National Headquarters immediately.

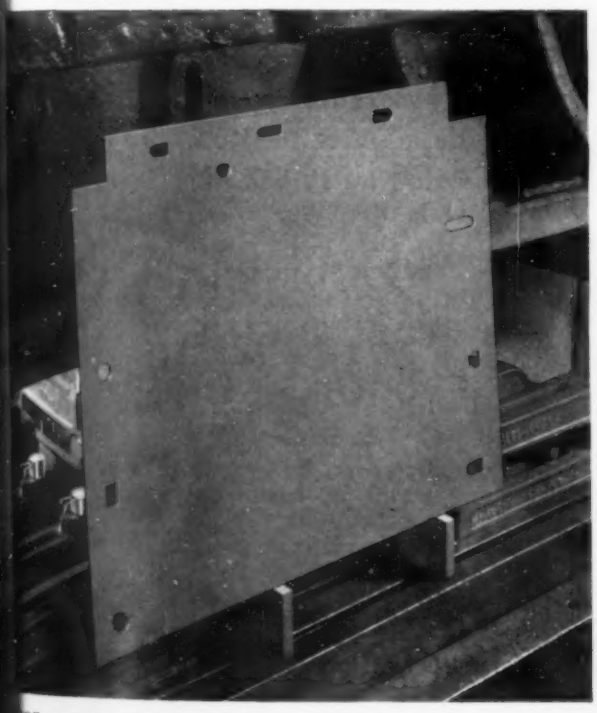
AMERICAN SOCIETY OF TOOL ENGINEERS

10700 Puritan Ave. • Detroit 38, Michigan

Production.....

.....'way out ahead

WALES HOLE PUNCHING & NOTCHING EQUIPMENT



TOP—Wales Type "BL" Hole Punching Units and Wales Type "N" Notching Units in a combination staggered hole punching and notching set-up in a press brake.

BOTTOM—Typical round and shaped holes plus corner notches produced by Wales Type "BL" Hole Punching Units and Type "N" Notching Units in a stamping press.

By providing simpler, faster set-up methods, Wales Hole Punching and Notching Units *insure greater production economies.*

For example, a group of these independent, self-contained Wales Units may be set up for punching and notching to produce parts the same day a pattern is released for production. These "Right-Into-Production" advantages are made possible by proven Wales features:

- Nothing attached to press ram
- Punches and dies always in perfect alignment
- No die set required
- Independent and self-contained
- Set up in press brakes and stamping presses on templates, T-slotted plates or press brake rails
- Uniform shut height requires only one ram adjustment
- Units may be used in unlimited set-ups eliminating "dead storage"

Before putting holes and notches in angles, channels, extrusions and sheets by *any* method, have the Wales facts at your finger tips. Write today for your personal copy of Wales BL catalog.

WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

393 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

How to reduce your costs with surface finish control

"Eliminates arguments on surface finish," says Sterling Engine Company, "thus we have realized definite dollar savings with the SURFINDICATOR". This company uses the instrument to check finish on precision parts where a microinch finish is specified. Delays on inspection questions are eliminated.

SURFINDICATOR* SAVES INSPECTION TIME

WITH SURFACE FINISH CONTROL you can reduce your production costs—speed inspection, eliminate costly over-finishing, end guesswork. And you don't have to invest in costly laboratory equipment to realize these benefits.

The SURFINDICATOR was designed for you to use on the production line. It can be quickly set up—operated by anyone. It is a precision instrument that can be calibrated on the job, yet is priced within the range of even the small-volume shop. In case after case the SURFINDICATOR has quickly paid for itself through economies in production. Send coupon now for complete information.

*Trade-Mark

Surfindicator used to check surface finish on blades. The instrument allows a positive reading to meet specifications, as opposed to a visual inspection possible only with trained personnel.

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
ULTRASONIC EQUIPMENT

formerly
The Brush Development Co.
Brush Electronics Company
is an operating unit of
Clevite Corporation.

Brush Electronics Company, Dept. V-2
3405 Perkins Avenue, Cleveland 14, Ohio

☐ Please send free copy of "Surface Finish Control".
☐ Have your nearest representative demonstrate the SURFINDICATOR to me.

Name _____

Position _____

Company _____

Address _____

City _____ *State* _____

Index of the Tool Engineer Advertisers

February 1955 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in 1954 ASTE Industrial Exposition — ♦User of ASTE Data Sheets

BENCO COLLETS

FOR ACME MACHINES

will not break off at the threads or your money back

Due to our unique design and specialized manufacturing process we can guarantee that Benco Collets for Acme Machines will not break off at the threads . . . on a money back or free replacement basis.

Benco Collets are made from high carbon, alloy tool steel, not carburized steel. The threads have a tensile strength of more than 175,000 per square inch. Benco Collets have a guaranteed accuracy of .001 run-out per inch of bar extension from the face of the collet.

With all their extra features and your money-back guarantee, Benco Collets for Acme Machines cost no more than ordinary collets. You can save trouble, time and money by using Benco Collets . . . they assure you maximum satisfaction regardless of the size and type of material you use. You can't lose when you buy Benco Collets for your Acme Machines . . . they won't break off at the threads or you get your money back or a free collet. Specify Benco every time—for quality—for value—for performance.

Above is a 1" collet removed from a 1" machine. Imagine the cost of the wreck this collet caused! These two pieces had to be removed from the machine and a new collet installed with loss of time and production.

The Benco Collet shown at the left, due to special engineering, will not break off at the threads.

the **BENCO** *line includes:*

- Master Pushers and Pads
- Master Collets and Pads
- Pushers and Feed Fingers
- Solid Collets
- Ejector Collets
- Carbide-faced Stock Stops for B. & S. Machines
- Collet Sleeves and Chuck Nuts for B. & S. Machines

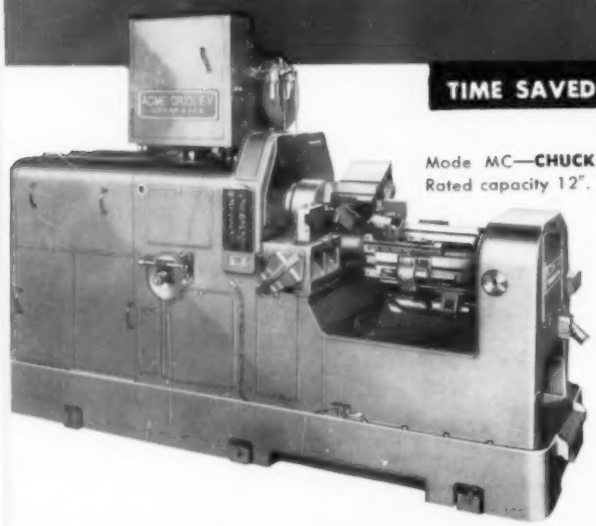
Benco COLLET MANUFACTURING CO.

CLEVELAND 14, OHIO

REPRESENTATIVES: Tornquist Machinery Company, Los Angeles, Calif.; Dorow Machine Tools, Wichita, Kan.; Harry Dunn Corp., Houston, Texas; J. K. Bousum Co., Detroit, Mich.; Walter J. Greenleaf Co., Pittsburgh and Erie, Pa.; Hospelhorn Tool & Supply Co., Dayton, Ohio; Kel-Sir Company, Milwaukee, Wisc.; Mason & Luttrell Sales Eng., Okemos, Mich.; Fred J. McMillen, Providence, R. I.; Pearse-Dengel Tool Company, Hasbrouck Heights, N. J.; Philadelphia Tool Company, Bala-Cynwyd, Pa.; Erwin A. Slate, Gasport, N.Y.; W. C. Straub, Cleveland, Ohio; G. W. Wittlinger, Chicago, Ill.; J. E. Dilworth Company, Memphis, Tenn.; H. M. Scherling, Minneapolis, Minn.; Die Makers Supply Co., Kansas City, Mo.; H. F. Soderling Co., Seattle, Wash.; Production Tools, Toronto, Canada.

CAN YOU TURN NON-PRODUCTIVE TIME INTO SAVINGS LIKE THESE?

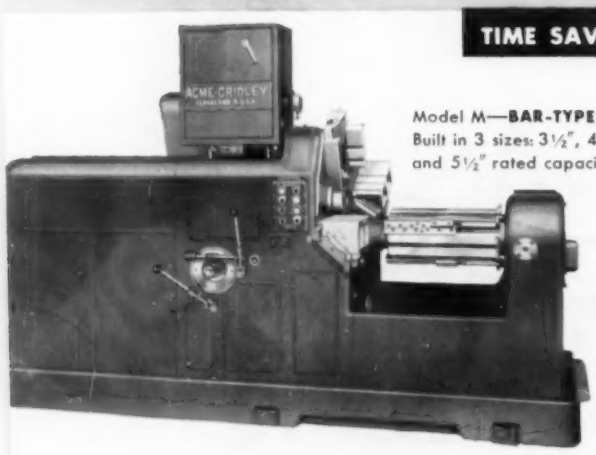
On each of the examples shown here, most of the savings resulted from reducing the time between cuts. Almost all modern machines can make chips as fast as present day cutting tools can "take it," but only Automatically Controlled Cycle* gives you an opportunity to save where it counts most — by reducing non-productive time required to withdraw the tool, index the turret and advance the tool to the work. Acme-Gridley Fully Automatic Turret Lathes do this job at accelerated speeds — with minimum waste of time and manpower.



Mode MC—**CHUCK-TYPE**
Rated capacity 12".

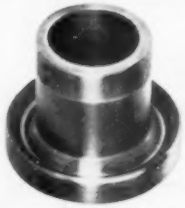
TIME SAVED on Acme-Gridley Fully Automatic Chuck-Type Turret Lathe

Part Name	Finger Holder Body	Master Collet Blank
Material	6⅝" dia. Semi-Steel	6" dia. 4160 Steel (Solid
Former Time	39.2 minutes	98 minutes
"MC" Time	11.2 minutes	35.4 minutes
	Savings 28 Min.	**Savings 62.6 M**



Model M—**BAR-TYPE**
Built in 3 sizes: 3½", 4¼" and 5½" rated capacities

TIME SAVED on Acme-Gridley Fully Automatic Bar-Type Turret Lathe



Part Name	Sleeve—4x3¼" long	Whirl—3½x4⅛" lon
Material	1112 Steel	Leaded Open Hearth St
Former Time	30 minutes	21 minutes
"M" Time	6 minutes	5.7 minutes
	Savings 24 Min.	**Savings 15.3 M**

Here's what AUTOMATICALLY CONTROLLED CYCLE* means to you

- The complete machining cycle is faster because all non-productive movements are performed automatically — and at *accelerated* speeds.
- Cuts are made (with either high-speed or carbide tooling) as fast as present day cutting tools can take it.
- Producing rate is thus predetermined and remains the same at the end of the shift as at the start.
- Machining is done at the surface speed best suited for required finish and tolerance because each toolslide is independently cammed and selective spindle speeds are automatically controlled.

Standard on all Acme-Gridleys

The NATIONAL ACME COMPANY

184 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY
and CHUCKING AUTO
1-4-6 and 8 Spindle
Thread Rolling Machines
matic Threading Dies
Limit Motor Starter
Starter Switches
Contract Manufac